CHEMICAL INDUSTRIES

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Executives and Technicians

IT was wholesome experience for both the American Chemical Society and the American chemical industry to have joined hands in celebrating the tercentenary of the establishment of chemical manufacturing in the United States. Professor Hixson's committee accomplished a great deal more than breaking all previous records for attendance at a meeting of any scientific association.

Very properly, the meeting emphasized the achievements of the industry, for we are all of us too prone to forget that without the businessman who harvests for our use the fruits of chemical research, the chemist would be cropping a sterile field. It is natural enough that the chemist should collect the popular plaudits for the great and valuable triumphs of chemistry in the service of mankind, and the businessman's natural instincts are not inclined to make him jealous of the medals and honorary degrees, the praise and the publicity that award the successes of the scientific man. Nevertheless this one-sided distribution of the honors has had a subtle effect upon both these partners in chemical progress, which is not wholly good for either.

The well publicized recognition of the technician, and the badly overdone neglect of the executive, tends at once to puff up the ego of the former and drive the latter more and more to the hard-boiled philosophy of "take the cash and let the credit go." Thus, the chemist is encouraged in that silly snobbery that looks upon the chemical industry and all its works as a disgusting white slave traffic of pure science; and the businessman is tempted to regard chemistry a dangerous narcotic that drugs its devotees till they become senseless and spineless dreamers. Fortunately, few technicians or executives hold these views in these extreme forms, but there is no hiding the fact that the thinking of many a good man in both groups is so tainted.

Most chemists have little flair for business. Very few businessmen are scientifically minded. But all chemists are not commercial nincompoops, nor are all businessmen industrial thugs. No one with any close acquaintance in either group believes such nonsense, and the better technicians and executives become acquainted, the more they understand the distinctive and necessary contribution each partner makes to American chemical progress.

The I. C. I.'s 1934 Earnings Report

If there is any truth in the oft-repeated saying that our own recovery from the depression is lagging a year behind Great Britain's, the American chemical industry and its stockholders should be forewarned by the bitter disappointment in London financial circles caused by the recently published annual report of 1934 earnings of Imperial Chemical Industries, Ltd. Though gross income established a new record of £7,965,038, this total is but £301,093 greater than the previous year which had shown an increase of £1,248,522 over 1932.

If the English investing public regard chemical securities as the "modern bonanza" which Wall Street is becoming to believe is to be found in chemical company common stocks, this disappointment is quite natural. Nevertheless, as far as one may judge from a balance sheet which reveals nothing of the earnings of subsidiaries and gives no details of expenses, the management has been able and conservative.

It is interesting to note that the increase in earnings available for common stock dividends of £56,315 is very closely equal to the reduction of £56,409 in taxes paid. This last item is one which we wager will not be paralleled by American experience. But it will still be interesting to test this "year later" theory by comparing the 1935 statements of our larger chemical companies as they come through quarterly with the I. C. I.'s 1934 figures. With certain obvious exceptions it must be admitted that the pattern fits sufficiently well to please those who entertain this engaging notion.

Keeping Equipment off the Sick List

Somehow or other the term plant maintenance implies a host of disagreeable tasks. In a certain sense such an implication is not very far from the truth where maintenance and emergency repairs are usually synonymous, but in well-ordered establishments maintenance is merely a homely mixture of foresightedness and good housekeeping.

Far too little attention is likely to be given in the original design and placing of equipment in its relation to the ever-present problem of inspection, repair, and general maintenance. Intelligent use of knowledge gained through past failures and successes will prove invaluable in providing for correct design where such experience can be called upon. A little closer cooperation with the engineers of the company supplying the equipment, possibly a franker explanation of what is to be expected, what is to be done, can eliminate many faults that appear too often only in actual operation.

It would seem that these truths are self-evident, but gather together two or more chemical engineers or consultants and in all probability you will hear of many such instances, of course, with names omitted. No industry, with the possible exception of the food industry, is faced with the problem of purity of product to a greater extent than are the chemical and closely allied divisions. Aside from the use of proper raw materials the end-product is dependent almost entirely on proper design of equipment in the first place and secondly on the physical condition of the plant. Larger chemical companies have found that plant maintenance is not a janitor's job but one that requires the full time of a trained engineer—a specialist in keeping both buildings and equipment off the "sick-list."

When Good Fellows Get Together

A happy omen of the past unhappy winter season has been a revival of constructive activity upon the part of three local chemical associations in our three largest cities. In New York, the Salesmen's Association, after a number of years devoted wholly to "parties," have begun to meet again at lunch to listen to a serious talk. The election of so forceful and farsighted an executive as Frank L. McCartney to the presidency of the Chicago Drug and Chemical Association, to lead the largest membership enrolled in that organization's fifteen years existence, is a pledge of greater activity. The Philadelphia Chemical Club, second only to Boston's Drysalters Club in age, is bestirring itself, having reorganized its membership requirements and is heartily undertaking a new and more diversified program. These are all healthy signs. These local foci of chemical interest can all do a great deal more for the industry and their members than to serve as a stimulus for closer acquaintance and better mutual understanding among chemical competitors.

Quotation Marks

If any illusions are still entertained about foreign intellectual leadership in chemistry they will be dispelled by the revelation of Europeans coming to these shores to learn chemistry in our universities and plants. Lastly, there will be the cheering news of research that has been conducted throughout the depression with scarcely any diminution of the old vigor.—*N. Y. Times.*

Today's Broader Problems of the Chemical Industry

By Harry L. Derby

President, American Cyanamid & Chemical Corporation

I TAKE no small pride in being one of the thousands of members of our industry for I believe there is no industry in America which has so well acquitted itself during the last five years as has the chemical industry. Where some industries operated at 15 or 20 per cent., and some even less, with thousands of their men without employment and on the public dole, our industry has gone through that trying period with a record of average employment above 75 per cent. Now this comes about through no mere accident or special conditions of the times. The chemical industry has been able to do this through the foresight, ingenuity and courage of the men in the industry, who, at the close of the World War, had confidence in the future of America and were willing to back that confidence with capital investments and the expenditure of money in research and development.

Our industry has cooperated with the President in his administration of the N.R.A. and has faithfully lived up to the code prepared by the industry and accepted by the Government. It has spread employment in its plants; kept ahead of or apace with any general increase in labor rates and has done its part to relieve conditions of unemployment and depression. There is no other industry in America that has spent so much money during the last five years on replacements, repairs and extensions as has the chemical industry—the aggregate being well over $50,000,000 in 1934 alone. That there have been no major labor disturbances in the chemical industry speaks well for its management.

I hope these introductory remarks will lead no one to the conclusion that it is my belief that we can and will stand on our record, feeling that we have accomplished our objective. On the contrary, the future of the Chemical Industry has greater possibilities of development than ever in our history. Almost daily new products of great importance to public welfare, public health and national advancement are being placed on the market and their benefit to the State becomes immediate.

There are those in public office who believe that any unit of industry which has not proved itself efficient should be scrapped and the desired materials purchased abroad—those products to be made in foreign countries, by foreign laborers and shipped on foreign vessels, in order to carry out the idea of reciprocal trading. Had the chemical industry been measured by these standards and treated to that formula, the record of progress would be an entirely different story. No new chemical is discovered and at once manufactured efficiently. The process of chemical research and chemical development depends on the slow, studious, hard work necessary in the chemical research laboratory and in the pilot plant, and if this progress were to be throttled by ruinous foreign competition, before it had started, advancement in our industry would be doomed.

I have never been able to grasp the logic of the reasoning that we, as a nation, benefit by an exchange of goods—unless the goods we sell could not otherwise be sold, and unless the goods purchased could not be manufactured here. It is perfectly evident that foreign nations are not going to buy our products unless it is to their advantage to do so. Unless those products are cheaper, more attractive, and better than they can buy at home, why on earth should they purchase them from us?

Our nation places no restrictions, nor do we impose any duty on two-thirds of the goods that are shipped to us from foreign shores. We have always encouraged foreign trade and under the much condemned Hawley-Smoot Tariff Law the same policy was adhered to. The United States, however, has taken the position that in our purchases we shall have the right to elect what products shall come in without duty, but we also reserve the right to protect American manufacturers, paying high rates of wages—with the high standards of living that result therefrom—at least to the extent of equalizing by a duty the cost of production here with that of the cost of production in a foreign country. I have never seen the logic which condemns the policy of taxing importations to an extent to equalize this difference in cost and thereby obtain revenue for the Government from such duties as will in a measure offset the taxes and other service charges that American industry is forced to contribute to Government maintenance. Nevertheless, there is a concerted movement, backed by the influence of foreign producers, to build up sentiment in this country based on the slogan "we can-

not sell if we do not buy." If this propaganda is successful it will tear down our protective tariff structures and place American labor on the same low standards as in foreign nations. In spite of all our difficulties, the people of this nation are in infinitely better condition than those of almost any foreign nation. Are we to further increase unemployment—are we to reduce our labor rates--are we to sacrifice the progress of the last hundred years on an altar of free international trade built on the false principle that prosperity can only be obtained through the exporting of goods?

No nation in the world has the potential market of America. In the height of our prosperity 85 per cent. of our goods produced in this country were consumed at home. Any foreign nation would be glad to trade its poverty-stricken market for the huge purchasing power of this country. To carry out this reciprocal scheme in its entirety will have most disastrous results to America. That great humorist, Will Rogers, once well stated, "The United States has never lost a war nor won a conference," and that remark is one to remember in the present reciprocal tariff conferences.

You men come in contact with every line of industry. You are alert to the advance and decline in industry. No other industry serves such a diversified number of manufacturing enterprises. Many of the smaller manufacturers are unmindful at this time of the result of this program of tariff destruction. It seems to me our duty to convey the truth of this matter to those whose business might be seriously affected or entirely destroyed through it.

Our nation is face to face with a future in which there is grave uncertainty. We are either on the threshold of prosperity or may face disaster through uncontrolled inflation. Neither this nation nor any other can continue to spend far in excess of its income without reaching a point where its money no longer has the value stamped upon it. Business today would be on a steady upgrade, if the confidence of American men and capital were restored and if they could see in the future, Government cooperation and wise financial policy. Bureaucracy is being built up in a system, which, if continued, will result in oppression from which no one can possibly escape. Efforts through legislation to incite labor against capital should be condemned; the despotic formula which denies an individual his constitutional right to treat and have personal relations with his employer has no place in America. No man should be compelled to pay tribute to outside organizations in order to earn his daily wage, nor is there any social justice in a plan which overthrows the right of an American laborer to work when he sees fit to work without interference from any outside organization.

Those who would deny industry the right to make a profit lose sight of the fact that it is only through profits that a Government may collect a tax. The expenses of Government have mounted to huge proportions.

We, of our industry, may feel that we are in the fortunate position where, through the great diversity of products and the universal use of our materials, whatever degree of prosperity exists as an average for all industry will exist for us. But no nation stands still—it either goes forward or it goes backward. I believe in the future of America. I believe that the American citizen, when he understands all the facts, can be depended upon to give a wise decision, and that as the course of time runs on we will find this nation swinging back to the old principles which have served us well, coming down to a sound foundation upon which honest work for an honest dollar is to be desired, in preference to Government gratuity. The American laboring man does not want charity; he wants employment and an opportunity to sell his services at the best procurable figure. He does not want to be treated as one of a herd of sheep but he wants the freedom of action, thought and decision that is guaranteed to him under the Constitution. I believe the average manufacturer is fair and reasonable, and that he wants only an opportunity to do his business in an orderly way, honestly and fairly.

There seem to be those who desire to upset harmonious relations between employer and employee. They seek to bring about a so-called "Social Revolution." Let us consider thoughtfully before abandoning the lessons of our history in favor of experiments, many of which have been tried and found wanting.

Salt Production, 1934

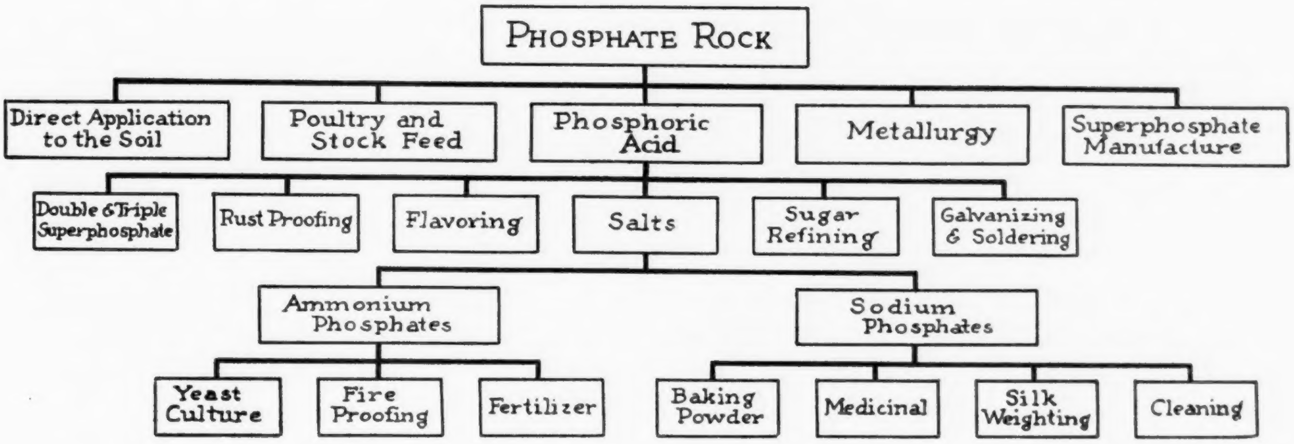
Salt produced for sale or use by operators of salt mines, wells, and ponds in the United States in '34 totaled 7,612,074 short tons valued at $22,850,797, an increase of 0.1 per cent. in quantity and two per cent. in value compared with 1933 (7,604,972 short tons, $22,318,086). The output of evaporated salt in 1934 (2,281,453 tons valued at $14,771,502) represented 30 per cent. of the total quantity of salt produced, and decreased three per cent. in quantity and two per cent. in value compared with 1933 (2,358,954 tons, $15,064,491). The salt content (3,417,439 tons) of the brine produced and used by producers in the manufacture of chemicals represented 45 per cent. of the total salt output and a decrease of one per cent. in quantity from 1933. Rock salt produced (1,913,182 tons valued at $6,306,095) represented 25 per cent. of the total output, an increase of seven per cent. in quantity and 13 per cent. in value over 1933 (1,784,992 tons, $5,570,352). The average value of all salt in 1934, $3.00 a short ton, was seven cents more than in 1933; that of evaporated salt, including pressed blocks from evaporated salt, was $6.48, nine cents more than in 1933; and that of rock salt was $3.30, 18 cents more than in 1933, according to data prepared by the U. S. Bureau of Mines.

Seventy-three plants (61 companies) reported operations in 1934 compared with 74 plants (57 companies) in 1933.

Salt imported for consumption in 1934 amounted to 53,124 short tons valued at $120,520, an increase of 76 per cent. in quantity and 74 per cent. in value over 1933 (30,132 short tons, $69,392). Exports of salt amounted to 105,365 short tons valued at $615,724 in 1934, a small decrease in both quantity and value from 1933 (105,178 short tons valued at $626,694).

Chemical Raw Materials I —

Phosphate Rock



SINCE 1843, when Sir John Lawes first made superphosphate by acidulating mineral phosphates, no major changes have been made, either in the methods of mining phosphate rock or in the chemical process that converts it into a fertilizer material, until quite recently. The process invented by the founder of the great English experiment station at Rothamstead is at once easy and economical to operate. Treatment of the raw rock with sulfuric acid is so simple, so cheap, so efficient that the operation appeared to be almost progress-proof.

Upon the basis of this simple chemical operation was slowly built up an enormous industry. The world consumption of phosphate rock, which was 3.5 million tons in 1900 and had reached double this total just before the World War, has now grown to over 10 million tons. Viewing the world market broadly, two significant trends are plain: the increasing importance of foreign sources (notably from Morocco) and a growing consumption in chemical and metallurgical industries.

In 1900 the United States produced more than half the world's supply of phosphate rock. By 1913 our share of the world output had dropped to 43 per cent. It has now shrunk to about 36 per cent. These figures of total production do not, however, reveal the declining importance of American phosphate rock in world commerce, for we have in recent years been exporting only about a third of our production and in world trade our tonnage is third, following Tunis and Morocco.

In our domestic consumption the growth of chemical and metallurgical uses of phosphate rock has been constant and, during the past ten years, very rapid. These markets increased from 30,000 tons in 1900, to 90,000 tons in 1913, to 222,000 in the depression year of 1932. These non-fertilizer industries now represent something more than 20 per cent. of our domestic phosphate consumption. It is notable that these markets held up well during the bad years 1930-1935.

Behind this array of percentages lie the stories of the loss of our dominating position as world's supplier of phosphatic raw material and of six new technological developments.

The first of these technological changes came in the mining operations and during the war. As a result of the labor shortage and the heavy fertilizer demands, pick and shovel were replaced in the Florida and Tennessee fields by the steam shovel, and later by the dragline for removing the overburden and in Florida by hydraulic mining. Since 1928 the flotation process has been introduced, making possible a metallurgical recovery of better than 90 per cent. as against the old washer recovery of hardly better than 50 per cent.

It was shortly after the war that the first furnace production of phosphoric acid was introduced at the Swann plant at Anniston, Ala. This electric furnace operation was followed in 1929 by the blast furnace of the Victor Chemical Works at Chattanooga. These successful commercial operations supply pure phosphoric acid not only for various chemical enterprises but also for the production of so-called triple superphosphate, made by treating rock with phosphoric, instead of sulfuric acid.

The ammoniation of superphosphate for the manufacture of high test fertilizers is another recent development. Although Sir John Lawes, the pioneer maker of superphosphate, in his advertisements in 1843 advocated its use to "fix" ammonia in "dung heaps, cesspools, gas liquors, etc.," and though since it has long been put to this use as a deodorant in stables, nevertheless, only recently has a practical method been worked out to use this principle in commercial fertilizer manufacture. Barrett and du Pont, among the ammonia sellers, and Armour and Ober, among the fertilizer makers, have done much to introduce this improvement.

The latest developments are based upon the results of more scrupulous examination of the chemistry involved in the process of making phosphate rock readily available—that is, readily soluble—for plant use. Fluorine is found in all American and most foreign phosphate rocks; in fact, the principal phosphatic constituent is usually calcium fluorphosphate. This calcium fluorphosphate is responsible both for the low solubility of the phosphorus in raw rock and for the sluggish reaction of the rock with phosphoric acid. Efforts to remove these handicaps chemically by decomposing this fluorphosphate have led to the calcination process for the production of available phosphates by heating raw rock with alkali salts (sulfates or carbonates of sodium and potassium). This process is commercially in its infancy; but, as we shall see, it is full of interesting possibilities. Not the least interesting of these is the better recovery of fluorine made possible by calcination methods, for it should not be overlooked that phosphate rock is also the commercial source of fluorine, an element for which new uses are unfolding as insecticide and refrigerant.

This sudden spurt of technological advance in producing and processing phosphate rock has come after a long period during which the old methods had remained all but unchanged and the history of this valuable chemical raw material was written almost wholly in the terms of the discovery and exploitation of new deposits. Such deposits are extensive and scattered in many parts of the world.

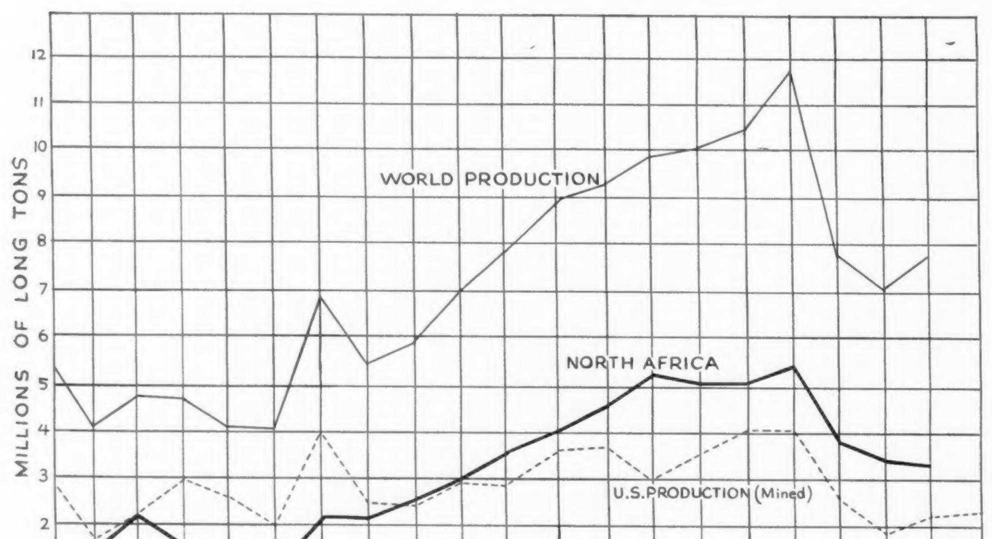
In 1845 Henslow discovered in Cambridge the nodular deposits of calcium phosphate which were worked up by Lawes and the other early British superphosphate manufacturers. In 1867 the deposits near Charleston, S. C., were discovered, and because of their high phosphorus content promptly became world headquarters, and were worked to exhaustion by the end of the century. Ten years later the Belgian phosphatic chalks were discovered, and in 1886 the nodular deposits in the Somme Valley, France, were first worked. Neither of these sources, though important locally, has been a serious factor in world trade. The rich and extensive phosphate fields of Florida were opened up by the working of the Peace River pebble deposits in 1887; the hard rock in 1889; and the land pebble in 1890. After gradually supplanting the Carolina production, the

Phosphate Rock Production

(In long tons, 000 omitted)

	World Production	U. S. Production (Mined)	North Africa	Oceania
1914	5,416	2,734	1,687	307
1915	4,115	1,836	1,633	293
1916	4,834	2,169	2,176	246
1917	4,708	2,852	1,420	234
1918	4,187	2,491	1,069	195
1919	4,153	1,852	1,108	169
1920	6,867	3,975	2,246	337
1921	5,431	2,426	2,385	458
1922	5,943	2,337	2,604	413
1923	7,114	2,944	3,056	447
1924	7,780	2,845	3,622	577
1925	8,897	3,482	4,151	527
1926	9,375	3,592	4,695	603
1927	9,888	3,025	5,366	694
1928	10,095	3,523	5,144	684
1929	10,476	3,822	5,113	829
1930	11,773	3,951	5,419	688
1931	7,863	2,578	3,871	504
1932	7,123	1,739	3,585	559
1933	8,067	2,309	3,490A	692B
1934	....	2,677	....	...

A Does not include Egypt's production; B does not include Makatea Island production.



The growth in the consumption of phosphate rock, particularly in the past 15 years and the rise of North Africa to its present dominant position in the international markets is graphically shown in this chart of world production

Imports of Phosphate Rock by Leading Countries

(Long tons, 000 omitted)

	France		Germany		Italy		Japan		Netherlands		Spain		United Kingdom	
	Total Imports	From U. S.	Total Imports	From U. S.	Total Imports	From. U. S.	Total Imports	From U. S.	Total Imports	From U. S.	Total Imports	From U. S.	Total Imports	From U. S.
1914	661	...	420	not avail.	514	...	285	...	160	...	202	...	494	...
1915	326	4	...	...	457	8	136	...	29	48	212	66	380	79
1916	286	22	...	...	435	6	98	...	73	28	288	65	331	58
1917	135	8	...	...	230	...	155	...	5	7	130	61	277	45
1918	233	10	...	...	232	1	90	...	...	...	115	12	465	13
1919	503	...	...	...	449	...	192	...	29	41	100	35	356	48
1920	881	...	133	117	400	...	294	48	115	90	243	167	529	163
1921	706	20	277	171	568	7	212	21	103	95	381	133	414	93
1922	1,169	27	380	165	556	...	285	8	172	106	247	122	365	56
1923	1,439	31	305	269	699	21	156	14	211	76	363	95	335	59
1924	1,473	9	371	221	877	58	281	46	293	124	406	110	421	55
1925	1,511	3	492	183	871	70	277	95	303	136	469	108	385	32
1926	1,557	...	495	89	905	87	538	96	344	81	491	95	321	19
1927	1,607	...	827	220	836	88	588	131	395	136	548	72	453	26
1928	1,553	...	822	216	618	96	584	184	368	140	570	76	342	8
1929	1,745	3	955	349	778	66	668	249	378	76	587	74	415	10
1930	1,638	2	888	388	848	73	689	288	439	61	608	68	502	36
1931	1,024	...	548	303	447	45	495	221	261	44	434	75	326	12
1932	1,000	2	465	149	443	52	646	141	312	28	564	78	397	2
1933	991	3	741	271	656	70	813	157	295	40	528	73	391	28
1934	985	3	866	289	676	83	...	218	369	69	584	93	438	19

Florida phosphate rock has continued to dominate the American production, accounting today for approximately 85 per cent. of our supplies. During the early nineties the deposits in Tennessee were discovered, and since 1900 have produced about a fifth of our domestic supplies. An increasing output, still inconsiderable, has been coming from the large but industrially inaccessible deposits in Wyoming and Idaho.

Since the outbreak of the World War, foreign sources of phosphates have undergone a tremendous expansion. The North African field is now ahead of the United States in total output. The phosphates in Algeria and Tunis were discovered in 1873, but not disclosed until 1886. Small scale production in Algeria began in 1889 and was markedly extended in 1894. Tunisian production started in 1899 and has been continually increased to a peak of 3.3 million tons in 1930.

Although Tunis, up to 1935, has been the largest single producer outside of the United States, and the largest exporter in the world, nevertheless the rapid and sensational exploitation of the Moroccoan deposits by the French Government forecasts that North African leadership will eventually become theirs. These deposits were not found until 1912, and were not worked extensively till 1921; but within ten short years Moroccoan output reached a total of nearly two million tons. The mines are owned by the Government and worked under a state-owned corporation known as L'Office Cherifien, which is operated as a private company by Government appointed officers and directors. The deposits not only contain very high grade material, running generally better than 73 per cent. B.P.L. (bone phosphate of lime) with less than one per cent. of iron and alumina; but they are also very favorably located two hundred miles from the good seaport of Casablanca with a down grade rail line over which the loaded cars travel by gravity. Since the deposits are extremely available and considerable convict labor is employed, mining costs are very low. Moreover, the freight rates to European importing ports are just about half those from Florida, and the modern, efficient loading facilities at Casablanca have been built with twice the capacity of any material handled up to this time at the docks. Finally, a new, larger, and richer deposit was located in 1929. This has been thoroughy prospected, and preliminary work completed ready for active exploitation at any time.

A third great center of phosphate rock production is found among the Pacific Islands, notably for the extremely high quality of material (over 80 per cent.) which they produce. The first of these exploited was on Christmas Island, in the Malay Archipelago, in 1899. The Germans worked the deposits on Ocean Island in 1902; but during the war this island and the neighboring Nauru passed under British mandate and are now vigorously operated by the British Phosphate Commissioners, most of this output going to the young fertilizer industries that are being carefully encouraged in Australia and New Zealand.

Although the world's consumption of phosphate rock has been growing constantly, and there is every reason to believe that it will increase progressively, nevertheless there are no fears of exhaustion. Many of the best known deposits are enormous and despite vigorous and wasteful mining hardly a bite has been taken out of the reserves. For example, nearly half a century's operations in Florida are estimated to have taken out not more than two or three per cent. of the phosphate in the field. In commercial practice in this country no rock has been considered profitable for mining that ran under 40 per cent. material, and the trend has been steadily towards higher and higher analysis rock; accordingly, the flotation process is certain to have far reaching effects both upon the material that can be economically mined and also upon the grades offered in the market. G. R. Mansfield's carefully estimated

world resources of phosphate rock, printed below, are, in the light of the recoveries possible by flotation, extremely conservative:

Country	*Reserves Metric Tons*	*Grade % B.P.L.*
United States	6,431,000,000	60-70+
Tunisia	1,000,000,000	58-68
Algeria	1,452,000,000	58-68
Morocco	1,400,000,000	70-78
Egypt	179,000,000	60+
Nauru and Ocean Is.	140,000,000	80-88
Makatea Is.	10,000,000	80+
Angaur Is.	3,000,000	80+
Rasa Is.	3,000,000	75
Palestine	4,000,000	47-80+
Total High Grade	10,622,000,000	Generally 60+

Country	*Reserves Metric Tons*	*Grade % B.P.L.*
Russia	5,568,000,000	Less than 50
Spain	10,000,000	" " 50
Siberia	667,000,000	" " 50
Total Low Grade	6,245,000,000	Less than 50
Grand Total	16,867,000,000	

[*To be Concluded in the June Issue*]

The statistics in this and the concluding article are based on data furnished by the U. S. Bureau of Mines, the Phosphate Rock Export Association and A. N. Gray's statistical material in "Phosphates and Superphosphates."

Magnesite Industry in 1934

During 1934 production of 100,973 short tons of crude magnesite was reported from three mines in California and one in Washington. This was a decrease of 6.7 per cent. from the quantity mined in 1933 (108,187 tons), but it still showed a substantial increase over 1932 (38,462 tons), according to a report issued by the U. S. Bureau of Mines.

On September 1, 1934, the California Chemical Corporation, Sierra Magnesite Company, Ltd., and Industrial Chemical Corporation, Ltd., were consolidated into a single corporation known as California Chemical Company (executive offices, 220 Bush Street, San Francisco, Calif.), but it was announced that the various plants of the former organizations will continue to operate as units of the new company. In addition to the production of magnesite by the Sierra Magnesite Company from its Bald Eagle mine, near Gustine, in Stanislaus County, and from the Western mine, near Livermore, in Santa Clara County, magnesite was also mined at one other property in California in 1934, about 30 miles above Patterson, in Stanislaus County, by Robert H. Smith (address, 1758 Mills Tower, San Francisco, Calif.). The Northwest Magnesite Company (executive offices, Farmers Bank Building, Pittsburgh, Pa.), operated its Finch mine, near Chewelah, in Stevens County, Wash.

The total consumption of domestic magnesite was lower than in 1933, but this decrease was accompanied by a moderate increase in imports. With the exception of a very slight increase in the quantity of crude magnesite sold by producers, all sales showed decreases in both quantity and value. Sales of magnesite of domestic origin in 1934, as reported by producers, were 1,588 short tons of crude, valued at $18,393, an increase of slightly less than 1 per cent. in quantity and a decrease of 11.4 per cent. in value compared with 1933; 7,528 short tons of caustic calcined, valued at $222,415, a decrease of 7.5 per cent. in quantity and 10.7 per cent. in value from 1933; and 38,535 short tons of dead-burned, valued at $670,343, a decrease of 11.6 per cent. in quantity and 13.5 per cent. in value from 1933. There was an increase in the quantity of magnesite sold for insulating, and in addition to sales of magnesite for refractory, plastic, insulating, and medicinal purposes, some special calcined material was sold to the rubber trade.

Industry's Bookshelf

Marketing Industrial Equipment, by Bernard Lester, 307 pages. McGraw-Hill Book Co., N. Y. City. $3.50.

The first book devoted to a comprehensive study of the problems involved in distributing machinery and equipment from the manufacturer to the ultimate user. Deals specifically with methods of market and product analysis, principles involved in economic distribution, and the organization and operation of the sales department and sales outlets.

Elements of Marketing, by Paul D. Converse, 1005 pages. Prentice-Hall, Inc., N. Y. City. $5.00.

This is a revised edition of this standard work on marketing, and contains valuable references to the first nation-wide censuses of marketing—the Census of Distribution, taken in '30, and the Census of American Business, taken in '34; also new reports of the Federal Trade Commission. It deals in an authoritative way with the marketing factors introduced by the New Deal, such agencies as the AAA, the NRA, and others.

Unit Processes in Organic Synthesis, by P. H. Groggins, 689 pages. McGraw-Hill Book Co., N. Y. City. $5.50.

This pioneering work fills a gap in the literature of chemical engineering. It presents in a systematic manner the principles and problems of the more important and well-defined reactions in organic synthesis as they are found in actual plant practice. The book includes: an examination of the reactants; an inquiry into the mechanism of the reaction; a knowledge of the chemical and physical factors involved; observations regarding the design and construction of equipment; and illustrative technical applications.

Secular and Cyclical Movements in the Production and Price of Copper, by Charles Louis Knight, 153 pages. University of Pennsylvania Press, Philadelphia. $2.00.

A very detailed study of prices and trends. Contains a wealth of statistical matter particularly well presented. With many of the most important chemicals dependent in part at least on the price of copper, chemical executives, buyers and economists will find this book invaluable.

Taxation under the AAA, by Kingman Brewster, James S. Y. Ivins and Percy Phillips, 341 pages. $5.00.

A clarifying discussion of a very involved and highly controversial subject.

Quantitative Analysis, by Alfred Stock, Arthur Stahler, translated from the German by Winton Patnode and L. M. Dennis. McGraw-Hill Book Co., N. Y. City. $1.75.

The primary purpose of this book is to present a college laboratory course in quantitative analysis, written from the standpoint of methods and procedures. With the exception of gas analysis, it covers the field comprehensively. The approach and presentation are unique in that the general methods and procedures used in quantitative analysis are described in detail in the first part of the book, and the theory underlying each major subdivision precedes the specific examples. Details of manipulation and apparatus are also given.

Annual Reports of the Progress of Applied Chemistry, published by the Society of Chemical Industry, London, England, 840 pages. Price to members 7s.6d., to others 12s.6d.

Each year this voluminous report appears, recording the advances made in all divisions of applied chemistry. Written by experts it brings under one cover a systematic and authentic summary that should be read and then kept for future reference by both technicians and business executives in the chemical and allied fields. It is written so that but a minimum of technical training is necessary to read it profitably.

Which Cellulose Derivative?

A Series of Simple Physical and Chemical Tests

By Harold A. Levey

WITH so many synthetic products now in daily use, even the casual observer frequently wonders just what kind of material enters into their composition. Therefore some readily available method, easily applied, to identify the group or type of substance used as the basic material in the make-up of these articles, should be acceptable. Since cellulose is a most difficult material to work with chemically, cellulose derivatives are rather recent types of synthetic products.

The nearest non-cellulosic material, completely supplanted by cellulose derivatives, is the protein material gelatin. This, in its various forms, has for several decades past been fabricated, in a limited way, into silk-like filaments or thin transparent sheets, and mixed with a variety of additives, it has been molded. In all of these fields, however, it has been almost completely supplanted with a material whose base is essentially cellulose. These cellulose products in nearly every case are far superior in their utilitarian value to the gelatin materials, and in most cases they are slightly lower in cost.

During the eighties of the last century, the Baron de Chardonnet was the first successfully to produce filaments from a cellulose derivative. These filaments were made from cellulose nitrate, denitrated to a more or less complete degree, with the purpose of reducing their very high flammability. About this same time, Hyatt, in this country, first began to manufacture, in a commercial way, cellulose nitrate, compounded with what was then an unique plasticizer, camphor, which facilitated its reduction into useful physical forms. It was more than ten years later that the blending of these two materials resulted in a material that could readily be worked.

Much impetus was thus given to the chemical study of cellulose. In the early nineties two new cellulose products were evolved, cellulose acetate and a regenerated cellulose termed "viscose." Another form of regenerated cellulose produced by the cuprammonium process was developed at an earlier date, but was never used commercially to any degree. Just before the World War there was developed another type of derivatives, known as cellulose ethers. While these last have many desirable properties, yet at the present their price is too high to permit extensive use.

Forms of Cellulosic Materials

Nearly all of these products appear on the market in the form of filaments as silk substitutes (rayon), or as horse hair and the like. In the form of sheeting we recognize them as "Celluloid" or "pyroxylin" as used in our cameras and movies, auto side curtains, lamp shades and related products. When the sheeting appears sufficiently thin as to be used as a wrapping paper, it is sold under such trade names as "Cellophane," "Sylphrap," "Inceloid," "Kodapak," "Protectoid," etc. As the molding art has recently attained high development of thermo-plastics, a large number of very attractive objects are now made so because of these types of materials. Fountain pens, umbrella handles, many ornaments and many toilet articles are composed of these types of products.

Fortunately sufficient difference in the chemical and physical properties of these various products exists readily to characterize them without going through chemical analysis in a laboratory. Most of this material is now found in such commodities as fabrics, or relatively thin sheets. Hence, we can readily apply certain easy procedure which easily identifies any one of these substances.

Let us take for example a thin sheeting such as is used as wrapping material. By far the bulk of this material is made from "viscose" and sold as "Cellophane" and "Sylphrap." To determine whether this is the case, probably the best thing to do is first to put it in your mouth between your tongue and your upper palate and hold it there for several seconds. On removal it will show a very considerable elongation or stretch when it is pulled, if it is made from viscose or gelatin. There are two methods of determining, however, which of these substances is used: The first:

If this sheeting is viscose you will note that it possesses a decidedly sweet taste, due to the fact that glycerine is added to render it flexible. On the other hand, if it tastes very bitter, then the material is undoubtedly a gelatin sheet: because this type is hardened with formaldehyde, tannin, or alums. The second test is to burn a small piece of the sample. The burning rate will be approximately the same so far as the untrained eye will be concerned. However, comparative tests will frequently show that under identical conditions the viscose sheet will show a slightly faster burning rate than that of the gelatin. In addition, the observer will notice that on burning the viscose sheet the odor is quite similar to that of burning tissue paper, while burning gelatin will have an odor similar to that of burning flesh, or other burning protein material. In addition, it will also be observed that the burnt residue of the viscose sheet will be a fluffy black chalk-like mass; while that of the gelatin will be a caramel-like tacky material, which melts and flows during the burning operation.

An Odorless, Tasteless Material

Should the material tested not possess properties which readily classify it in either of the above groups, it may be that the material is made from a cellulose acetate plastic. The sample will then burn at a substantially lower rate, and while burning, will give off an odor strongly resembling burning sugar, caramel char, or the like. In the burning operation, cellulose acetate material fuses in the flame, and may actually drip off, much in the fashion of sealing wax. Even if the material is transparent, the flame seems to be different from that of carbonaceous materials due to the variety of plasticizers used with this type of material. Frequently these give a characteristic color. This material has neither odor nor taste.

Nearly all of the thicker sheetings are made from a cellulose nitrate base. This material has no odor or taste when placed in your mouth. However, if this type of product is heated by briskly rubbing with the hand, or otherwise elevating its temperature, an unmistakable odor of camphor appears. Obviously, this material, unless heavily incorporated with inert pigments, will possess an exceedingly rapid burning rate. It therefore becomes necessary for the operator to hold a sample in the flame with a suitable pair of tweezers to prevent injury to his hands. During the burning operation, the characteristic odors of the nitric oxides will be in evidence. If a sufficient quantity of the material is burned in a partially closed vessel the usual brown color will be apparent.

On the market is a form of viscose sheeting coated with a thin layer of cellulose nitrate to render it moisture-resistant. This product is sold under the trade names of "moisture-proof Cellophane" or "Nymphrap." On moistening in the mouth it will not show the same distortion or elongation as the ordinary viscose or Cellophane sheeting. Its behavior on wetting will be more like that of cellulose acetate sheeting. However, if allowed to soak in water for several minutes, the thin layer of cellulose nitrate or film on each side of the viscose sheeting can be made to float off, or readily be peeled with the fingers. The burning rate of this type of material is considerably faster than that of the ordinary viscose sheeting. At the same time the odor of the nitric oxides can be readily detected as well as that of certain resins included in their coating film.

The cellulose ethers have not yet come into universal use. However, with price reductions, we expect to see them used in all of the above mentioned forms. Their behavior is much the same as cellulose acetate, except that in burning they more closely resemble viscose.

Cellulose regenerated by the cuprammonium process is used only in the manufacture of artificial silk of the rayon type. It is not possible to distinguish this product from viscose rayon except through chemical means. Small amounts of cuprammonium regenerated cellulose in the form of sheeting have been imported from Germany.

Only a limited amount of casein has been made into sheeting of any marked transparency. Nearly all our materials made from casein are pigmented or dyed. As it hardens to a greater degree in the presence of formaldehyde, tannin, and the alums, casein can be readily differentiated from gelatin by its higher resistance to the action of water. The increased water absorption of gelatin results in a substantial swelling and softening, which does not prevail to a substantial degree with casein-made products.

While these substances can all be readily identified with precision in a chemical laboratory, it has been my purpose to present first methods which enable the layman to identify these substances with means available to him. Most of these tests can be conducted without destroying the object. In the case of molded products, a sufficiently large portion can usually be removed from the base without substantially disfiguring the object. With a little practice and close adherence to these suggestions, the reader will be able to obtain success in these very simple tests.

By the use of solubility reactions the chemist can readily ascertain any definite cellulose derivative. As is characteristic in organic chemistry, there is no universal solvent for all of these products. The esters and ethers, however, do have a common solvent, viz., acetone, for those derivatives found on our American market. Regenerated cellulose, on the other hand, can be readily distinguished because of its insolubility in acetone.

Esters can be readily distinguished from ethers, owing to the latter's solubility in benzol and the related aromatic hydrocarbons. These are non-solvents, when used alone, for the cellulose esters.

As the only cellulose esters used commercially are cellulose nitrate and cellulose acetate, these may be

readily separated or identified with the use of suitable solvents and non-solvents. Amyl acetate is a very active solvent for the cellulose nitrates, and at the same time a complete non-solvent for the cellulose acetates. This substance, accordingly, becomes a very useful reagent for this work. To check the question, we may use acetylene tetrachloride (symmetrical tetrachlorethane) which has solvent action with cellulose acetates parallel to that of amyl acetate with the cellulose nitrates; *i.e.*, acetylene tetrachloride is an active solvent for nearly all forms of the cellulose acetates, and at the same time a complete non-solvent for the cellulose nitrates.

Distinguishing between Viscose and Cuprammonium Cellulose

The two forms of regenerated cellulose are viscose cellulose and cuprammonium cellulose, and the most effective means of distinguishing between them is by their different action toward dyestuffs. Viscose is scarcely colored by direct dyes at 20° C., while cuprammonium cellulose is dyed deeply. When viscose has been previously treated with soda, it has more affinity for these dyes, but even in this case it does not dye near as deeply as does cuprammonium cellulose.[1] In addition, they may be distinguished by immersing in a 1 per cent. solution of silver nitrate, 4 per cent. sodium thiosulphite, and 4 per cent. sodium hydroxide. This test solution is prepared by dissolving the silver nitrate and the sodium thiosulphate separately, and adding the first solution to the second until the cloudiness disappears. The sodium hydroxide solution is then added to this mixture, and same brought up to correct volume, boiled, and filtered. If the regenerated cellulose has been prepared by means of the viscose reaction, the immersed portion will stain to a brown or reddish brown color. Regenerated cellulose prepared by the cuprammonium process so treated will remain unstained. Cellulose nitrate will also produce a brown stain, but this form can be readily distinguished from the regenerated cellulose by means of its different solubility reactions.

However, if the cellulose nitrate material, particularly in the form of fibres, has been partially denitrated, then it will not respond to the action of the solvents for the cellulose nitrates. In order to distinguish partially denitrated cellulose nitrate from the regenerated celluloses, the sample to be tested is moistened with a 1 per cent. solution of diphenylamine in concentrated sulfuric acid of a sp. gr. 1.84. The partially denitrated cellulose nitrate will immediately assume a deep blue color, and will dissolve rapidly to form a blue solution; while the regenerated cellulose will not be colored blue, and will dissolve very slowly.[2]

Certain protein materials of animal origin serve in rôles similar to cellulosic materials. These products consist essentially of gelatin and also casein. Casein can readily be distinguished chemically from gelatin, which is the only protein material containing none of the following amino acids: oxyglutaminic, valine and tryptophane.[3]

While these materials are not chemically related to cellulose, we find them in the market in the same physical forms as we do the above referred to cellulosic products. They can be readily distinguished from the cellulose esters and ethers by the solvents for the above materials, except glacial acetic acid, which is a solvent for the cellulose derivatives as well as the proteins, and is the only known common solvent for them. As glacial acetic acid is a non-solvent for the above-referred-to two forms of regenerated cellulose, therefore the regenerated cellulose is insoluble in glacial acetic acid.

These substances are seldom used as such alone in the make-up of the products which appear on the market. They are always intimately admixed with suitable substances which act as plasticizers to reduce their fragility and increase their elasticity, as well as their general utility. In the case of the cellulose esters and ethers, these substances usually consist of a solvent of such high boiling point, as permanently to remain in the mixture. The solvent is usually an organic ester.

Moreover, each of these substances has certain plasticizers, which serve them most effectively. With cellulose nitrate, it is usually camphor. With the cellulose acetates, triphenyl phosphate is frequently used, as well as several of the sulphonamid derivatives, which also serve as plasticizers for the cellulose ethers. Glycerol and certain of the polyglycols are frequently used with viscose, cuprammonium cellulose, as well as gelatin and casein. Occasionally certain of these additives interfere with the solubility reactions, but if the sample is properly prepared, this condition will seldom be of sufficient importance to prevent the successful identification with the efficient use of the above facts.

Uses of Cellulose Nitrate

As cellulose nitrate has so long and successfully been used as a lacquer, it is frequently applied to various forms of regenerated cellulose as well as the protein materials. It is interesting to note that the transparent sheeting now available on the American market under the trade name of "moisture-proof Cellophane" consists of a thin sheet of viscose which is coated with a cellulose nitrate lacquer. More recently gelatin sheeting has been coated in a similar fashion, thus rendering it waterproof. We have a reverse condition taking place in movie and camera films, where the body of the material is cellulose nitrate or cellulose acetate, coated on both of its faces with a thin film of gelatin. Obviously, these surface coatings would first have to be removed before the identification tests could be applied to the base material.

It is hardly practicable, in the light of the above, to formulate a specific method of procedure when the

substance in question may be readily characterized. Some comments regarding the nature of the samples might be made. In the identification of the several forms of synthetic fibres, viz., viscose cellulose, cuprammonium cellulose, cellulose acetate, and denitrated cellulose nitrate, the recommended procedure would be to immerse a portion of the fibres in acetylene tetrachloride. If the fibres are composed of cellulose acetate, they will quickly pass into solution. If they are not cellulose acetate, the tests for distinguishing between partially denitrated cellulose nitrate and regenerated celluloses referred to above, with the use of diphenylamine and sulfuric acid, should be applied. Should these tests designate the material as regenerated cellulose, then the tests designate the material as regenerated cellulose, and the test with silver nitrate, sodium thiosulphate, and sodium hydroxide should be applied to determine whether the material is viscose or cuprammonium. As synthetic fibres are never coated with other materials, no difficulties will arise from this source.

In testing sheet materials obviously any coating material will first have to be removed. As this is usually cellulose nitrate, or even if it may be of cellulose acetate, this coating can be readily dissolved by immersion in acetone. This solution can be subsequently evaporated, and the residue identified as described above. In the case of molded objects the protective coating layer can readily be scraped off, and a sample taken by boring or otherwise removing a portion of the body material at such a place as will least disfigure the object.

The ability of a solvent to plastify, must be distinguished from that of solvent power. The solution should be evaporated to dryness on a piece of glass. The film can be readily removed after thorough drying, and forms a so-called self-sustaining film. This fact, in itself, is quite indicative of a cellulosic derivative, which distinguishes it from resinous materials that form extremely fragile films which separate with difficulty from the surface.

While cellulose products are seldom mixed with each other, they are frequently compounded with resins and plasticizers. Both of these have a wider range of solvents than do the cellulose derivatives. However, the film which they deposit on evaporation can readily be distinguished from that of the cellulosic film as described above.

1. Textile Forsch. 12, 1-3 (1930); Chimie & Industrie 24, 1183 (1930).
2. The Chemists' Year Book 1930, p. 974.
3. Introduction to Physiological Chemistry; Meyer Bodansky, 1st Ed. (1927), p. 88.

Calcium Chloride

Production of calcium chloride from natural brines in '34 was reported as 76,719 short tons valued at $1,153,159, an increase of 33 per cent. in quantity and 29 per cent. in value from 1933 (57,813 short tons, $893,442). Imports in 1934 amounted to 1,975 short tons valued at $26,271, compared with 3,583 short tons valued at $48,115 imported in 1933. Exports in 1934 amounted to 30,715 short tons valued at $566,189.

Natural Sodium Compounds

Production of sodium compounds, not including common salt, from natural salines and brines in the United States in 1934, as indicated by sales or shipments by producers, amounted to 347,375 short tons, valued at $6,222,352. These figures which include the output of sodium carbonate (soda ash and trona), sodium bicarbonate, sodium sulfate (salt cake and Glauber's salt), and sodium borate (borax and kernite), show an increase of 14 per cent. in quantity and 35 per cent. in value compared with the output in 1933 (305,047 short tons valued at $4,599,912), from data compiled by the U. S. Bureau of Mines.

The sodium carbonates reported in 1934 were from California and amounted to 88,325 short tons, valued at $1,254,113, compared with 70,461 tons, valued at 918,295 in 1933, an increase of 25 per cent. in quantity and 37 per cent. in value. They were produced in California from Owens Lake, Inyo County, by the Pacific Alkali Co. (Pacific Mutual Bldg., Los Angeles, Calif.), Bartlett (soda ash), and the Natural Soda Products Co. (650 South Spring St., Los Angeles, Calif.), Keeler (soda ash, sodium bicarbonate, and trona); and soda ash from Searles Lake, San Bernardino County, by the American Potash & Chemical Company, Trona, and by the West End Chemical Co. (Oakland, Calif.), West End.

Sodium sulfate (salt cake and Glauber's salt) shipments amounted to 16,650 tons valued at $148,225 in 1934 compared with 46,539 tons valued at $245,240 in 1933, a decrease of 64 per cent. in quantity and 39.5 per cent. in value. Production of salt cake was reported by the American Potash & Chemical Company, Trona, Calif.; the Rhodes Alkali & Chemical Corp. (Balboa Bldg., San Francisco, Calif.), near Mina, Mineral County, Nevada; the Ozark Chemical Co. (address, Tulsa, Oklahoma) near Monahans, Ward County, Texas; and a small amount for medicinal purposes by the Spokanogan Chemical Company (Spokane, Wash.) at Okanogan, Okanogan County, Washington. The sodium sulfate mines in Arizona were idle, and no sulfate was shipped in 1934. Hydrated sodium sulfate (Glauber's salt) was produced near Casper, Laramie County, Wyoming, by W. E. Pratt. The Iowa Soda Products Co. (Council Bluffs, Iowa) mined Glauber's salt near Rawlins, Carbon County, Wyoming, and shipped to Council Bluffs, Iowa, for refining. Sodium sulfate was also produced experimentally near Twentynine Palms, San Bernardino County, California, by the Chemical Mines Co. No shipments were made from the deposit near Saltair, Utah.

Total imports of sodium sulfate in 1934 amounted to 98,643 short tons valued at $954,447, a decrease of 11 per cent. in both quantity and value from 1933. Imports of salt cake (anhydrous sodium sulfate) amounted to 8,409 short tons valued at $151,490 in 1934, compared with 10,731 short tons valued at $179,529 in 1933; imports of Glauber's salt (hydrous sodium sulfate) amounted to 533 short tons valued at $4,116 in 1934 against 629 short tons valued at $8,677 in 1933, and imports of crude sodium sulfate (salt cake) amounted to $89,701 short tons valued at $799,141, compared with 99,269 short tons valued at $885,306 in 1933. Exports of sodium sulfate are not separately recorded.

The total boron minerals shipped by producers in 1934 amounted to 242,500 short tons, valued at $4,822,014 compared with 188,047 short tons valued at $3,436,377 in 1933.

Sodium borate, as borax, was produced in California in 1934 from Searles Lake brines in San Bernardino County, by the American Potash & Chemical Co. (233 Broadway, New York City, and Trona, Calif.), at Trona, and by the West End Chemical Co., at West End; also from Owens Lake brines in Inyo County, by the Pacific Alkali Co. at Bartlett. Sodium borate, as "kernite," was mined in Kern County, California, by the Pacific Coast Borax Co. (51 Madison Avenue, New York City) from the Baker deposit near Barstow. Boric acid was produced at Trona, Inyo County, Calif., by the American Potash & Chemical Co. In the figures of production, this product calculated as borax was included in sodium borate.

Solvents and Thinners

By R. M. Carter

Research Chemist, U. S. Industrial Alcohol Company

UNLIKE the liquid vehicle of ordinary paints, the solvents and thinners of lacquers do not, with the exception of the plasticizer, form a constituent part of the final film. They serve merely as a means to an end.

In the early years of nitrocellulose lacquers, the available solvents were few. Amyl acetate and fusel oil were most commonly used, although as early as 1850 such solvent mixtures as ether-alcohol, and camphor-turpentine were in use. With the advent of low-viscosity nitrocellulose, attention was focused sharply upon the available solvents. The great possibilities which opened up before the infant lacquer industry stimulated active research in the solvent field. The result, as you all know, is the amazing variety of solvents now available for the myriad specialized uses of lacquers. As examples, one may draw attention to the production of n-amyl acetate from pentane, of cellosolve acetate from ethylene, of secondary butyl and amyl acetate from isobutylene and isoamylene, of ethyl lactate from acetaldehyde and hydrocyanic acid.

The commonly used lacquer solvents fall into three general classes: (1) Alcohols, (2) esters, and (3) ketones. There are also numerous solvents in general use which are of the "two-type" class, that is, they combine in one substance the properties of two different classes. For example, ethyl lactate contains both an ester and an alcohol group, while cellosolve acetate has both an ester and an ether group. The esters and ketones are active solvents, while the alcohols are latent solvents for nitrocellulose.

The ideal solvent should meet the following criteria:

1. Be a solvent for both the nitrocellulose and the resin.
2. Be non-hygroscopic.
3. Evaporate fast at the beginning and slowly at the end.
4. Produce solutions of low viscosity with fairly high concentrations of nitrocellulose.
5. Have no objectionable odor.
6. Should be stable, and have no untoward action on nitrocotton or pigment.
7. Stand dilution with hydrocarbon diluent.
8. Be cheap.
9. Be readily available.

Since no one solvent combines with all desirable properties, a mixture must be used. In the proper selection and proportioning of the ingredients of a solvent lies the art of the lacquer technologist. The selection of the proper nitrocellulose and resin may be much easier than the formulation of the proper solvent.

The available solvents have long been classified as to boiling point, as follows:

Low boiling point solvents (below 100° C., 212° F.).
Medium boiling point solvents (about 125° C., 255° F.).
High boiling point solvents (above 150° C., 300° F.).
Plasticizers (practically non-volatile at ordinary temperatures).

Such a classification is far from ideal but serves as a useful guide in marshalling data on the properties of individual solvents. A classification according to evaporation rate would probably be more useful than one by boiling range, but old customs are slow to change.

The low boiling point solvents, typified by ethyl acetate, include such solvents as isopropyl acetate, ethyl alcohol, ethyl propionate, isopropyl alcohol, and dioxan. Because of their high evaporation rate such solvents give a lacquer its ability to dry rapidly. They also serve to lower the viscosity of lacquers to a workable consistency. Low boiling point solvents are also the least expensive of the usual solvents.

While low boiling point solvents may be excellent solvents and will dry quickly, they do not of themselves give satisfactory films. They need the addition of medium boiling point solvents to insure the smooth flowing-out responsible for a smooth durable film. The latter class of solvents, so well typified by butyl acetate, also contains such compounds as amyl acetate (natural and synthetic), fusel oil, butyl alcohol, cellosolve acetate, secondary butyl and amyl acetates and alcohols. It is upon the medium boiling point solvents that we depend most for the ability to form a useful and dependable film.

The high boiling point solvents are the residual solvents which are responsible for the final smoothing out of the hardening film and for the continuous blending of the solid ingredients of the lacquer as the evaporation of the solvents draws to a close. Here we find such solvents as ethyl lactate, butyl cellosolve acetate, diacetone alcohol, β-hydroxybutyric ester, butyl cellosolve, etc.

While the high boiling point solvents play an important part in film formation, they can be and often are replaced by an equivalent amount of medium boiling point solvents.

The plasticizers form a very important group of lacquer solvents. They are non-volatile solvents for both resin and nitrocellulose, and their rôle is to impart flexibility, increase adhesion, and blend all the other non-volatile constituents of the film. They should have very slight solubility for water, thus eliminating absorption of atmospheric moisture by the film with subsequent deterioration. The most commonly used plasticizers belong to the class of esters. Plasticizers do not make films truly elastic, but they do increase the elongation of films under stress, at the same time decreasing their tensile strength.

Ethyl, butyl, or amyl phthalates, triphenyl and tricresyl phosphates, the high-boiling esters of the glycol ethers and camphor, are some of the better known plasticizers. A very great many chemical compounds have been advocated for this use, and many have highly specialized, but limited, uses. Patent literature is full of proposed plasticizers.

Until comparatively recently the only lacquer diluents used were the aromatic hydrocarbons, benzene, toluene and xylene. Benzol lost in favor because of its marked poisonous properties. The mounting price and scarcity of the other two led to research on available substitutes. As a result we have today a number of commercial diluents made from petroleum hydrocarbons. These have agreeable odors, are available in large quantity and are cheaper than the aromatic type. Their greatest disadvantage lies in their greater precipitating power for nitrocellulose when compared to the aromatic hydrocarbons, and to the fact that, other things being equal, they produce solutions of higher viscosity than the aromatics. The cost of the increased active solvent necessary in formulating a lacquer with these diluents is often more than offset by the lower cost of the diluent. The use of petroleum diluents has increased rapidly during the past few years, and today a number of the petroleum companies market special cuts for this use.

In connection with the use of hydrocarbon diluents it should be noted that the presence of aliphatic alcohols, non-solvents in themselves, increases very markedly the amount of hydrocarbon which may be added to a nitrocellulose solution and still get clear films. A mixture of any alcohol and any hydrocarbon is a better diluent than either ingredient alone.

Reid and Hoffman[1] have shown that a mixture of 70 per cent. xylene and 30 per cent. butyl alcohol evaporates (not boils) with constant composition and at a considerably higher rate than either ingredient alone. This explains why the addition of butyl alcohol to a mixture containing overmuch xylene results in the formation of a good film. The xylene, being removed at a faster rate, does not concentrate to the point where blushing, or precipitation of the nitrocellulose, would occur.

How does one judge the merits of several competing solvents for a particular use? How does one go about determining for oneself whether a ten or a twelve cent solvent is the cheaper to use? In most instances a determination of the dilution ratio, evaporation rate and blush resistance of a particular sample will be sufficient properly to gauge the value of any solvent. Other tests such as the viscosity characteristics are helpful but not always necessary.

A solution of nitrocellulose will tolerate the addition of a certain amount of non-solvent, after which further addition causes precipitation of the nitrocellulose. This limit of tolerance is called "dilution-ratio," and is numerically equal to the volume of diluent used divided by the volume of sample taken. There is as yet no standard method for carrying out this test, but the majority of solvent manufacturers and consumers are using the same basic scheme.

It is usual to quote dilution ratios in terms of two hydrocarbon diluents, toluene and some petroleum hydrocarbon. Due to the fact that no standard petroleum hydrocarbon diluent has yet been established, the published dilution ratios so determined show greater variation than in the case of toluene. The ratios are always smaller for petroleum hydrocarbons than for toluene, as mentioned earlier in the discussion of diluents.

The dilution ratio is the most convenient method available for expressing the relative solvent properties of liquids for nitrocellulose. The precipitating effect of new diluents is also determined by the same procedure, using a lacquer made with standard solvent mixture. The following table lists the dilution ratios of some of the more common solvents:

	Dilution Ratio	
	Toluol	*Petroleum Hydrocarbon*
Acetone	4.3	0.7
Amyl acetate, commercial	2.7	1.5
Butyl cellosolve	3.4	2.0
Butyl acetate	2.9	1.4
Cellosolve	5.3	1.1
Cellosolve acetate	2.4	0.8
Diacetone alcohol	3.3	0.5
Diethyl phthalate	3.8	0.7
Dibutyl phthalate	2.6	1.7
Diamyl phthalate	2.2	2.0
Diethyl carbonate	0.6	0.4
Ethyl acetate, 85 to 88 per cent.	3.5	1.1
Ethyl lactate	5.5	0.8
Ethyl oxy-butyrate	4.9	1.4
Secondary butyl acetate	2.8	1.4
Secondary amyl acetate	1.9	1.1
Pentacetate	2.2	1.3
Isopropyl acetate	2.8	1.0

It will be noted that an increase in molecular weight of the alcohol, as from ethyl to amyl acetate, or ethyl to amyl phthalate, results in decreasing toluene tolerance and increasing petroleum hydrocarbon tolerance. The presence of hydroxyl groups, as in ethyl lactate and cellosolve, results in high toluol tolerance but low petroleum tolerance. Within my own observation there

have been only two solvents whose petroleum and toluene tolerances are almost identical. These are diamyl phthalate and diethyl carbonate, one a strong, the other a relatively weak solvent.

The evaporation rate of a solvent is most important. It is the speed of evaporation that controls the sort of film formed when the volatile constituents evaporate from the non-volatile portion of a lacquer. The evenness and density of the coating depend in great measure on the speed with which the solvent leaves the emerging film. The vaporization of solvents from a lacquer and the proportioning of these solvents so that the mixture remains balanced during drying is an extremely complex problem. Solvents in lacquer do not evaporate at their boiling points when the lacquer is applied and dried in the usual manner. It has been shown that neither the boiling points nor the vapor pressures can be taken as an index of how the solvents will evaporate from a film. This is particularly true of mixtures which give off a mixture as a vapor which has a lower boiling point than the individual components, so at room temperature many solvents form evaporating mixtures with evaporation characteristics different from the individual components. These properties of solvents make it possible to produce combinations which act in a lacquer in a manner quite different from what an inspection of boiling points or vapor pressures might indicate. For this reason it is better to determine the evaporation rate of a solvent mixture containing the material in question, rather than the evaporation rate of the solvent mixture alone.

There is no standard method for determining evaporation rate, but considerable work has been done on the problem, and results by the more careful experimenters are quite comparable. However, all methods are empirical and one should not compare published rates unless he is sure that they were determined under comparable conditions.

One requisite of a good lacquer solvent is its resistance to humidity, or blush resistance. Blushing under moist conditions is due not so much to evaporation rate as to the solubility of water in the solvent. For example, a hydrocarbon solution of a resin will not blush at a given humidity, whereas an alcoholic solution of the same resin, although evaporating more slowly, will blush badly.

A determination of the solubility of water in the solvent gives a measure of the comparative blush resistances of solvents, but in order to determine the actual humidity under which blushing starts, a blush-resistance cabinet is used. This is, in essence, a closed cabinet arranged to allow for complete circulation of air of a definitely controlled humidity and temperature over panels coated with the nitrocellulose solution in question. By varying the humidity the point of initial blush may be determined. One may rate individual solvents in this manner, or a standard complete lacquer may be used, substituting therein the solvent in question.

Determinations of blush resistance are of especial help in the formulation of lacquer thinners. These thinners are mixtures of solvents and non-solvents, having considerably reduced solvent powers. They are especially useful to the small manufacturer or consumer who does not wish to take the time properly to formulate and blend his own thinners.

It is of considerable interest to note that the synthetic amyl and secondary butyl esters, the entire line of cellosolve compounds and the newer thinners are all derived from the rapidly growing field of petroleum chemistry.

The A.S.T.M. has published specifications and methods of tests for the more commonly used solvents. It has not as yet considered the "utility tests" such as blush resistance, evaporation rate and the like.

[1] Reid and Hoffman, *Industrial and Engineering Chemistry*, vol 20, p. 687.

Rubber in Testing Paint Coatings

In testing paint coatings to determine their chemical resistance, the common practice of immersing a panel in a reagent has the disadvantage of requiring an individual panel for every test made, proving both cumbersome and expensive. *The Rubber Age*, March, 1935, p. 295, reporting this, states that according to the Sherwin-Williams Company thinly coated panel corners also break down, making accurate recordings difficult. Another method, that of putting several drops of a reagent on a panel and covering with a watch glass, is also said to be unsatisfactory for several reasons including the fact that the reagent has a tendency to collect on the inner edge of the glass when the panel is tilted. For these reasons this company's laboratory has developed the "spot" method which permits the spraying of a uniform coat on a panel.

An airtight seal is made as follows: Rubber rings are cut from 1/16 inch inner tube stock. The inside diameter of the rings is 1⅛ inches and the outside diameter 1¾ inches. After cutting, the rings are immersed in a melted mixture consisting of 50 parts paraffine, 20 parts carnauba wax and 30 parts Halowax 1013. While the melting point of the mixture is about 200° F., it is advisable to hold the temperature of the melt between 250° and 300° F. to prevent solidification of the wax when rings are immersed.

Centers for the rings are marked off on the panel to be tested. The panel is then placed under a hot water tap, reverse side up. This pre-warming prevents chilling of the wax when the dipped rings are placed on the panel. Excess wax should always be drained off the rings before placing them on the panel, after which they should be pressed at several points to insure complete contact. As soon as the wax has cooled to the point where the surface gloss is lost, a 2,000 gm. brass weight is applied to mold the top of the wax to a smooth, level surface.

One cc. of reagent may be poured into each ring by means of a pipette. Three inch by two inch microscopic slides are generally satisfactory for covers. Since they are made of colorless glass, many observations may be made without removing them. When inspection of a particular spot is to be made, it is a simple matter to absorb the reagent into a swab of clean cotton to examine the paint surface.

This technique for making chemical resistance tests of a paint film is quick, easy, and accurate. The wax mixture indicated is not affected by any water soluble common acids or alkalies. Concentrations can be controlled by means of the seal, and all notations on reagent, film, time and results can be recorded right beside the ring on the panel. The panels may easily be kept for reference or observation at any time.

Has NRA Aided Recovery?

By A. J. Hettinger, Jr.

Executive Secretary, Durable Goods Industries Committee

WHAT might have been accomplished under a National Industrial Recovery Act will never be known. What has been accomplished by *the* National Recovery Administration is, on net balance, a retardation of industrial recovery. Ours has been a disorderly economic recovery. Sweeping advances, both in 1933 and 1934, were followed by confidence-wrecking, morale-testing declines. We have covered more ground, seen more action, and yet made less gain than the world as a whole. For the defensive character of a recovery in which sentiment has been worse than actual business and long-run confidence has been lacking, the NRA must accept a definite, even though quantitatively indeterminate, responsibility.

NRA Philosophy

The Recovery Act rested upon a "purchasing power" philosophy. Every effort of the Administration during those days was focused on the problem of restoring commodity price levels to or toward those prevailing in 1926; in part as a form of debtor relief and in part because of a sincere belief that higher prices, almost regardless of how achieved, spell prosperity. Parenthetically, it should be noted that a distorted, forced lift in commodity prices, operating (through codes) disproportionately on different industrial products, may serve to produce disequilibrium rather than equilibrium, thus retarding rather than accelerating the increased production of goods necessary to achieve the President's fine objective of a "more abundant life." Restoration of economic balance, a very different thing, provides through increased demand a sound basis for attaining that end, with flexible increases in commodity prices as a natural concomitant.

NRA's concept of recovery rested upon the application of two principles: mass reemployment and mass increase in purchasing power. Reemployment of millions of men at near-prosperity wage rates would result in a dramatic increase in "purchasing power." That was the theory.

The immediate strain of higher costs on corporate working capital, already reduced through the losses of the depression, was recognized. Increases in the price of articles produced and distributed under the codes were inevitable, but these were to be kept at a minimum during the early and crucial period of the Recovery Administration through (1) appeals to business to confine such advances to a maximum not greater than the increased out-of-pocket costs of production, and (2) application of the internal machinery of the Recovery Administration itself, notably the Consumer's Advisory Board, which, acting both through the NRA and through public opinion, would protect the buyer from unwarranted aggressive action of either producer or distributor. The net result of an increase in "purchasing power" far more rapid than the price of commodities would, it was believed, be increased demand, larger volumes, lower overheads, further gains in employment, and ultimately larger industrial profits.

This NRA program contravened time-tested, orthodox sequences in recovery. It represented a major gamble in favor of the thesis that economic planning under the government would proceed with such smooth precision as to enable industry to pay near-prosperity wage rates in the middle of a major depression, and that depleted working capital could stand the impact of sharply rising costs with complete reliance on rapid increases in volume, lower overheads, and, after a moderate time lag, increased profits.

Controversial Section 7-A

Controversial points, in the framing of NRA, which called for penetrating debate and clear definition, were glossed over through the enactment of generalized provisions which meant all things to all men. Section 7-A is merely one classic example. Congress evaded the difficult task of laying down an understandable labor policy. Subsequent interpretations of that section by labor and industry have been as far apart as the poles. The National Recovery Administration shirked the embarrassing necessity of defining that section in such a way as to provide a compass that could be relied on.

In this situation the NRA, settling nothing, has, to use an inelegant but thoroughly accurate term, messed

up the whole field of American labor relations—with an interminable series of labor disputes and strikes as the inevitable consequence.

The Recovery Administration goal was an admixture of recovery and reform. The framework through which this was to be obtained was characterized as "self-government in industry." That self-government was to be achieved through voluntary codes of fair competition created by industry itself, but audited by the Recovery Administration in order to protect the legitimately paramount public interest. Social reform required the elimination of child labor and the abolition of what can loosely be termed anti-social, sweatshop wages, all too frequent in the distressingly acute competition that characterized the latter stages of the depression. Superimposed upon these were so-called recovery objectives, which in the eyes of the Recovery Administration were represented by as sharp reductions in hours and increases in wage rates as industry could absorb and the establishment of trade practices whose implications were economic rather than social. The political mandate of Congress was interpreted as calling for the organization of labor as a counter-offensive to the organization of industry.

Misplaced Reliance on PWA

Fairness requires the frank recognition that the Recovery Administration relied upon the prompt expenditure of the $3,300,000,000 allocated to the Public Works Administration, which was to "prime the pump" by putting to work large numbers of men within a short period of time. That end was not attained. The Public Works Administration allocated funds on paper, but during the crucial first half-year made no *significant* contribution.

In the honest belief that crisis and emergency dominated all else, the Recovery Administration unconsciously made its decisions. Emotion, ballyhoo and speed became dominant. Orderly economic planning in the process of codification was a luxury impossible of attainment because of the time element. The great immediate goal became the once-famous PRA—the President's Re-employment Agreement—and the associated Blue Eagle campaign, which were expected to produce a mass increase in employment and pay rolls regardless of cost; this would hold the trenches until the process of codification was completed.

The ideal of voluntary codes of fair competition went by the board during the mad, hectic days of emotional and patriotic appeal during the last half of 1933. The objective became complete codification of American business by Christmas. In actual practice, regardless of the amenities of phraseology, industries were told that, if voluntary codes acceptable to the NRA were not submitted, the licensing provisions of the Act would be utilized and codes imposed. Many codes were voluntary in the truest sense of the term, but others were about as voluntary as the action of a victim raising his hands when confronted by a gun.

A codification of American industry is a colossal task. Sound codification required intimate knowledge of each industry for which codes were submitted. Conditions varied from industry to industry. Problems confronting large units in a given industry differed from those faced by the smaller producer. Working conditions and costs of living varied geographically and between small towns and larger centers. No direct correlation existed between labor rates and unit costs. Problems encountered in mass production were very different from those of decentralized distributive units. These difficulties are but typical of those that confronted NRA.

The establishment of sound underlying policies, flexible in their administration, is the essence of successful codification. NRA, operating on crisis-emergency schedules, neither had the time nor appreciated the importance of the establishment of such policies. Entirely without intent, horse-trading characteristics became dominant in the construction of the great bulk of codes.

Codes finally took form amidst the class of conflicting interests in the post-hearing conferences. Created in an environment of compromises dictated by the relative bargaining strength of labor and industry, and shaped with varying degrees of governmental pressure, they emerged as individual entities and not as carefully welded parts of a coordinated code structure. Too frequently the factual basis was weak, as time considerations forced reliance upon sheer guesswork. Intercode difficulties and conflicts were inevitable. The deputy administrator, facing a task verging upon the impossible, had merely done the best he could—occasionally dominating, often dominated by, the situation with which he was confronted.

Logical Unity in the Codes

It would be inaccurate to term the result a system of codes for American industry. The very word "system" implies orderliness and cohesion, a combination according to some rational principle. NRA had developed during the process of codification no clearly defined policies resting upon economic analysis and factual foundation on key controversial points of vital importance such as pricing, limitations on production through quotas or machine-hour restrictions, wage differentials as between the North and South, similar differentials between small towns and large cities; and no underlying philosophy controlling distinctions to be made between industries producing and those distributing goods. Certain rule-of-thumb formulas were, it is true, gradually adopted as a matter of sheer necessity in order to provide a procedure applicable to the most frequently recurring problems. Provisions based upon such formulas were frequently forced into codes in which they had no proper place, merely in order to conform to the latest edition of the so-called "model code" circulating at that moment within the NRA for the assistance of harassed deputy administrators.

If there were any logical unity running through NRA's codification, it would be possible to attempt gen-

eral appraisal of the codes. No such unity ever existed. NRA, chameleon-like, is too variegated a body to be described as a system. Within the broad scope of codification can be found every economic doctrine known to man, both sound and unsound. Certain codes have been admirably drawn, are consistent with the public interest as well as industry interest, and probably represent contributions both to social reform and to recovery. Other codes are not only unsound but utterly incapable of enforcement.

In the last analysis, laws must depend for their sanction on the approval of the community. NRA codes in theory are laws of the land, but many of them have bred lawlessness, simply because in the eyes of those affected they have been neither sound economics, sound ethics, nor sound common sense.

It is difficult to escape the conclusion that the National Recovery Administration's codification of American industry has made no net contribution toward the President's "more abundant life." On net balance it has probably tended to restrict production through high costs and prices, and, by virtue of provisions in the codes relating to curtailment of output and prohibition of new equipment, has interfered with the free movement of private initiative and enterprise. Lack of any clear-cut administrative policy with respect to prices, production controls and labor relations, to cite but three instances, has left business in a state of continued uncertainty which has been intensified by vacillation in code enforcement.

Placing the Responsibility

No honest critic can claim that either industry or labor has been free from blame for such weaknesses as exist in far too many codes. Industry, under pressure of forced wage increases that frequently resulted in an approximation of prosperity wage scales in the midst of a depression, sought to protect itself by obtaining so-called "fair" trade-practice provisions, which at times were inconsistent with the public welfare and inimical to recovery; and not infrequently time has proved the economic reasoning of industry unsound. Labor, not unnaturally, in the light of promises made and in the belief that prices and cost of living would advance rapidly toward 1926 levels, sought the protection of wage scales containing a contingent reserve of purchasing power.

The ultimate responsibility, however, was that of the Recovery Administration. It was the final arbiter. It had within its power the opportunity to demonstrate the ability of the government in the field of economic planning. Faced with an opportunity unequalled in the administrative branch of the government, an authority unhesitatingly used, and a responsibility for the welfare of the recovery program, it chose to violate every sound principle of economic planning, to sacrifice statesmanship for speed, and to substitute compromise and negotiation for principle and policy.

The National Industrial Recovery Act will expire by its own terms not later than June 16, 1935, and at that date there will have been no conclusive test of the possibility of codes of fair competition in American industry. This much seems clear: Any legislation succeeding the present NRA should be of the same temporary emergency character as the original act and preferably limited to one year. Continuance of the experiment beyond such a date should be based upon demonstrated performance. Codification should be limited to voluntary codes submitted by industries and audited by the Administration from the viewpoint of the public interest. There should be a clear recognition that no centralized federal administrative body can successfully prescribe detailed regulations governing the operations of a multitude of industries and companies existing and functioning under widely varying conditions in all parts of the United States. Flexibility should be sought, rather than rigidity imposed.

An increase in national real income, obtainable only with a maximum production of goods, should be striven for rather than the impossible achievement of recovery through scarcity. Higher prices should result from the restoration of economic balance and through increased demand rather than through either limitations on output or new capital investment, or emphasis on wage rates carried to such levels that they result in smaller pay envelopes; the laborer is worthy of his hire; yet he lives not on wage rates but by the purchasing power of his pay envelopes.

In certain industries, essentially those dealing with wasting natural resources, conditions may legitimately require in the public interest a degree of control of volume or price to an extent seldom found elsewhere. Under such conditions, the definitely controlling principle should be that the farther action of this character is approved, extending into fields otherwise restricted or prohibited by law, the greater the governmental supervision necessary.

Even now, it would be unfair to state that sound codification of American industry is impossible or has failed. It has not yet been attempted. NRA's honest but mistaken decisions during the last half of 1933 have thus far precluded the attempt.

Bromine in 1934

Production of bromine in '34 amounted to 15,344,290 pounds valued at $3,227,425, an increase of 51 per cent. in quantity and 58 per cent. in value over 1933 (10,147,960 pounds, $2,040,352). The increase in output in 1934 was from the plant recently erected at Wilmington, N. C., and represents the first commercial production of bromine directly from sea water. Bromine is used principally in the form of ethylene dibromide for the manufacture of ethyl gasoline.

Imports of ethylene dibromide in '34 amounted to 649,987 pounds valued at $143,164, compared with 290,410 pounds valued at $55,864 imported in 1933. Imports of potassium bromide in '34 amounted to 4,410 pounds valued at $1,047; in 1933, 9,921 pounds valued at $1,813. No raw bromine was imported in 1933 or 1934, and only small quantities of other salts.

New Products and Processes

A Digest of the Current Literature for the User of Chemicals

Use of Wood Flour in Rubber Compounding

By Harvey C. Jack

Wood flour has a very high dielectric strength, a quality essential in a multitude of rubber compounds, and objectionable in none. Due to its individual particle makeup it is capable of imparting considerable physical strength to completed compounds. The individual particles, nearly atomic in size, are not uniform and are fibrous in nature. Variation in size and fibrous nature of the pulverized wood permits the particles to effect a smooth, inter-locking bond when compounded, the result being a fine surface on the finished product.

The advantages of wood flour as a combining agent are found in both the physical and chemical nature of the product. Physically, it is a fine, amorphous material. This permits easy physical union with other substances. Chemically, the natural resins inherent in the wood aid in the union. Another key to its ready fusibility with other substances lies in its low ash content. Still another is found in the neutral nature of wood flour, an important factor in permitting its use in compounding.

These advantageous characteristics of wood flour result in the practical disappearance of its individual nature when used in conjunction with other materials. A finished rubber product may contain more than 50 per cent. of wood flour by volume and yet give no outward indication that wood flour has been used in the process. A perfect bond has been obtained and the completed product retains in it the original desirable qualities of wood flour, as well as those of the material with which it has been compounded.

Wood itself is a very light material, relatively. When manufactured into the form of wood flour the latter acquires the characteristic of bulk. This characteristic can be measured and its effect on the finished product may be gauged. Referred to as the "bulk factor" it is determined by the amount of volume occupied by a given weight of wood flour under any specified pressure. Compared with practically any other material wood flour will possess a greater "bulk factor." That is, wood flour will be found to occupy more volume for the same weight and pressure than other materials. This characteristic has particular significance in pressure molding, since lighter weight is often directly concerned with quality, depending upon the product and its market.

In its original form wood is composed of cellulose, lignin and various natural resins. The involved chemistry of these compositions has as yet been only partially explored. Greater use is found for these substances as new chemical break-downs are discovered, two recent examples being rayon and transparent cellulose. As with the wood itself, cellulose, lignin and natural resins compose the greater part of wood flour. The proportion of these three substances varies with the different species. This is most clearly evidenced by the difference, for example, between Oak and Pine. One is hard, one is soft, and they differ in physical strength. The difference between these two woods is largely physical, since both are composed of the same original materials. The size of the individual cells varies between species as well as the thickness of the cell walls. These factors have a vital effect upon the ultimate character of the wood flour. Due to these characteristics few species are completely satisfactory in the manufacture of wood flour.

In order to secure wood flour suitable for use, the original raw material must be subjected to several grinding operations. Still other measures are necessary, including careful screening, to insure absolute uniformity of the finished product. Various woods are used with White Pine, by far the most important. Final grades of wood flour are classified according to screen analysis. The rating is on the basis of the coarsest part of any particular grade. For example, our 60 mesh wood flour would analyze as follows:

Retained on 60 mesh	1.0%
Retained on 80 mesh	6.2%
Retained on 100 mesh	27.7%
Through 100 mesh	65.1%

The size opening in the screens used are 60 mesh—.0098 inches; 80 mesh—.0070 inches; 100 mesh—.0059 inches. Further differentiation in particle size is obtainable, finer than 100 mesh, the finest passing through 300 mesh. Grades that are 80 mesh, 100 mesh and 300 mesh are available. Where an extremely fine finish is desired, grades of wood flour finer than 60 mesh are used.

In its finished state wood flour has a very low ash content. The ash content is determined by placing a sample of wood flour in a porcelain crucible and leaving the vessel in a muffle furnace for 16 hours at 600° C. By weight the residual ash will be a maximum of ¾ of 1% of the original sample. All elements other than those composing the natural cellulose, lignin and resin compositions of the original wood flour are present in this remaining ash. Manganese, up to 3/1000 of 1%, has been isolated in this ash. Iron is not normally present in any quantity exceeding that of manganese. The presence of any element foreign to those composing the natural wood substances would have to be a small proportion of the ¾ of 1% ash content. As illustrated by the manganese content of the ash, the amount of any additional element is infinitesimal in quantity.

In summing up the advantages of wood flour we may include its dielectric strength, which adds physical strength to the compound; its low specific gravity, which imparts lighter weight to the finished product; its high bulk factor, giving greater coverage; its ready fusibility; its low ash content, and economy.

Wood flour may be used in the production of a wide variety of rubber goods, i.e., rubber footwear, flooring, hard rubber of all kinds including the modern hard rubber battery container. Current research will probably extend these uses considerably. The most common grade of wood flour used in the rubber industry is the 60 mesh. A 50 mesh grade may be used but it is not

recommended if a perfect finish is required. Where most exacting results are essential still finer grades should be used.—Abstracted from *The Rubber Age*, February, '35, p227.

Coatings

Aquaplex is an aqueous dispersion of a special resin of the alkyd type, and a distinctly new development in the use of synthetic resins. Manufactured by the Resinous Products & Chemical Co., Inc., 222 W. Washington Sq., Philadelphia, Pa.

Brushless, Durable Finish for Wood or Metal

An ideal brushless durable finish in high gloss or flat, for wood or metal, is announced by The Star Chemical Co., 2800 S. Crawford, Chicago, Ill. It is applied simply by wiping on with a soft cloth. Manufacturer claims "it is not affected by hot water, hot dishes or alcoholic beverages, and will not show press marks."

Water Repellent

"Waterlox Water Repellent," is a thin, water-white, non-staining material which has the property of moisture-proofing fiber, fabrics, paper, stucco, limestone, imported and domestic marble, as well as imitation marbles and travertines, etc. Penetrative qualities are excellent, and it does not materially change the color of the surface to which it is applied. It does not seal porous surfaces, but rather leaves them in their natural physical condition and rejects or repels moisture through chemical reaction. The producer, Waterlox, Inc., Barlum Tower, Detroit, Mich., suggests that as a treatment for the parchment or paper cones of dynamic reproducers, which must withstand humid atmospheres, its use would be ideal, as it would not greatly increase their weight. It can be brushed, sprayed or used as a dipping solution.

Plasticizer from Sugar

Sucrose Octa Acetate, a newly available sugar ester of wide industrial application, is being offered by the Niacet Chemicals Corp. This is the first of a series of derivatives utilizing cane sugar as an industrial raw material. New compound, prepared as a white, crystalline material, offers a wide range of possible applications because of its novel physical properties and wide range of solubilities in nearly all of the common organic solvents. After application to cloth and ironing, a glossy, water repellent surface is obtained. It may also be used as a resin plasticizer; in molding resins for electrical parts; and as a constituent in waterproofing insulating papers and similar materials.

New Furfural Process

The Research Institute of Fat Industries of Russia has elaborated a new method for the production of furfural by sublimating sunflower seed husk, according to the news edition of *Industrial and Engineering Chemistry*, February 20th. This dispenses with the complicated and expensive autoclave apparatus in which the process of pentosan hydrolysis and the conversion of resulting pentose into furfural is usually run. According to the new process the husk, which is first moistened with sulfuric acid, is heated in iron retorts coated with acid-proof material to 483°F. The yield of furfural amounts to 7 to 10 per cent. of the weight of the husk. In addition to furfural, acetic acid is also obtained simultaneously at a rate of 7 per cent.

Aromatic Amines in Resins

The condensation of aromatic amines, such as aniline with formaldehyde, leads to the formation of a type of resin which hardens upon heating, and which is finding application industrially, particularly in the manufacture of vulcanized fibre and electro-technical applications. *La Revue Generale des Matières Plastiques*, February, 1935, states that these amorphous products have really been known for a very long time, but have only recently been produced commercially. One resin in particular is indicated, which is obtained by the condensation of *p*-toluenesulfonamide and formaldehyde, and which has only very slight coloration and has plastic qualities.

Waterproofing Agent

Aridex WP, the new waterproofing agent, manufactured by du Pont, produces a water repellent finish on textiles of all kinds as well as on leather and paper. It recommends itself for the spotproofing of rayon and silk crepes, pile fabrics, hosiery, etc.

Leather Finishes

The use of pigmented finishes in leather dressing has been such that, at the present time, there are few leathers which are not doped. Either water or cellulose lacquers are used, the latter comparing very favorably with the former from the standpoints of appearance and fastness. *Chemical Trade Journal*, London, reporting on a paper delivered by H. Anderson, states that, a lacquer with a high tinctorial value and low obliterating or hiding power gives a more natural looking leather than one with a high hiding power and low tinctorial value, although the covering powers of the two lacquers, being the sum of the two properties, might be identical. Three forms of discoloration of white lacquers on leather occur: (*a*) That due to exposure to light; (*b*) that due to bleeding of the tannin during drying; and (*c*) that due to bleeding through storage. With regard to undercoats, results of experiments lead to the conclusion that the undercoat should be soluble in the lacquer in order to ensure adequate adhesion.

'34 Developments in Finishes

New outstanding finishes developed during '34 and described in *Industrial Finishing*:

Tortoiseshell Finish.—A ground coat of yellow lacquer which, when dry, is daubed with a special smut stain, and finally finished with specially formulated tortoiseshell transparent finishing lacquer. It is transparent, but possesses the deep, rich tone of tortoiseshell. It dries to a high gloss, and can be used on wooden handles and metal objects where a novelty finish is desired.

Morocco Finish.—A one-coat finish for metal, has outstanding highlight effects and the appearance of a cloth covering. It has the fineness and uniformity of wrinkled depth as contrasted with the heavy, coarse formation available in the past.

Perspiration-proof Enamels.—These enamels have remarkable resistance to this type of abuse. Obtainable in a one-coat black finish and in two-coat color finishes.

Toy Dipping Enamel (Air-Drying).—A new dipping enamel for wooden toys. It air-dries in 12 to 16 hours, and is used directly on wood. Has excellent sealing and hiding properties and these toys are usually striped with a special striping enamel that air-dries to handle in two to three hours.

Clear Metal Lacquer.—This finish withstands outdoor exposure for 12 months without breakdown or discoloration of the film; is perspiration and alcohol proof and extremely economical.

Textiles

One of the most troublesome causes of two-tone dyeing in silk fabrics has been traced to a difference in the average diameter ratios of silk filaments in two adjoining sections of the same fabric. The discovery proves that it is futile to correct this particular cause of two-tone by chemical adjustments in soaking, boiling-off or dyeing. *The American Silk and Rayon*

Journal, April '35, report that a study of the deterioration of silks by light of different wave-lengths gave the following results. Lead-weighted silk showed greater deterioration upon exposure to regions of the spectrum studied than did pure-dye or tin-weighted silks. The greatest deterioration in all of the silks under observation occurred during exposure to the entire region of the spectrum. Decrease in tensile strength under exposure to an unfiltered light source is due primarily to those rays below 3490 angstrom units. Deterioration appears to become more rapid as the time of exposure is increased beyond 72 hours, particularly in the case of lead-weighted silks.

Month's New Dyes

General Dyestuff's offerings of the month include: Chrysophenine YA Extra Conc., a well-known direct yellow used for dyeing cotton, rayon, and mixed fabrics. Leaves acetate silk white and can be easily discharged. Anthralan Red GG, a level dyeing acid red brought out by I.G. Of very good fastness to light; and meets the general requirements for ladies' dress goods. Well suited for printing of wool or silk. Benzo Fast Orange W S A, manufactured by General Aniline, a direct bright dyestuff which produces on cotton and rayon very bright shades of very good fastness to acid. Leaves acetate silk clear. Celliton Discharge Scarlet R L, a very bright shade on acetate silk which discharges easily, and is also recommended for application prints.

Ramasit A, for treating and processing cotton, rayon, and other vegetable fibers. A milky, white emulsion, which can be diluted with water in any desired ratio and remains quite stable. Fastusol Yellow LRA Extra, a direct color which produces very clear shades on cotton and rayon, leaving both silk and acetate silk clear white. Fastusol Orange L7GA, a bright, yellowish, direct orange of very superior fastness to light, which is recommended for dyeing cotton and rayon. Fast Garnet Salt G C, the stable Fast Color Salt of Fast Garnet G C Base, which is one-fifth the strength of this and produces shades of equal properties. Diazo Brilliant Scarlet 2BLA Extra Conc., which with beta naphthol produces on cotton and rayon full shades of a wash-fast, bluish scarlet. Celliton Fast Rubine 3 B, a new acetate silk color, producing also inexpensive pink shades. Celliton Fast Scarlet R, a new dyestuff for acetate silk, suitable for compound shades with all Celliton and Celliton Fast dyestuffs. Celliton Discharge Brown 5 R L, a reddish brown for acetate silk, easily dischargeable with Decroline Soluble Conc. Can also be used for application printing.

The Dyestuffs Division of du Pont has announced the addition of nine new members to its line of Rotalin colors. The new Rotalin Supra colors are: Rotalin Yellow G Supra; Orange R Supra; Chocolate Supra; Red S Concentrated Supra; Violet Concentrated Supra; Blue B Concentrated Supra; Brilliant Blue 2B Concentrated Supra; Green Y Concentrated Supra; and Black RM Supra. "Rotalin" is a registered trademark of the du Pont Company, and patents have been applied for for the new members. These have been added to the division's line of printing ink colors to fill the need for tinctorially strong colors which produce smooth even prints of good fastness to water, rubbing, oils and hot waxing.

Glass

A natural material with good possibilities for use in glass batches is pumicite, a powder or dust made up of small, sharp angular grains of volcanic ash. *The Glass Industry*, April '35, p111, gives data on the chemical analysis of native pumicite, and also describes the location of commercial deposits in this country. Its successful adoption as a glass raw material in two Russian plants is noted, with the added statement that its use greatly reduced the alkali requirements of the plant. Being high in alumina content, it may offer distinct possibilities as a source of alumina in colored glasses.

Spun and Toughened Glass for Wearing Apparel

Lingerie of spun glass, tinted in delicate shades, and shoes with heels of toughened glass are included in the coming season's French models. The lingerie bends but is unbreakable.

Glass silk (spun glass), pure white and fireproof, has been placed on the market as a display material by Friedrich & Dimmock. *The American Glass Review* announces that the firm has been producing glass wool (spun glass) since 1922 and large quantities have been sold for use in filtering chemicals, in air filters, in storage batteries, separators, etc. New product is made in crimped design, looking very much like silk and having an appealing sheen.

Safety Glass

In contrast to other safety glass manufacturing processes, in which the sandwich material is applied in the form of a previously manufactured foil, a new process applies a solution of polyvinyl acetate to each of the two glass surfaces which are to be united. *The Chemical Age* states that this type of safety glass offers the advantage of not requiring edge-sealing.

Polyacrylic Acid Basis for Safety Glass

A safety glass obtained by polymerization of certain polyacrylic acid derivatives which are distinguished by outstanding fastness to light and resistance to weathering action has been demonstrated in Germany. It represents a fundamental departure from the sandwich type of safety glass now in common use since it actually takes the form of a single sheet of organic material. When shattered by a heavy weight this organic glass breaks up into large pieces, the edges of which lack the sharpness of inorganic glass splinters. It is also a notable improvement in that it can be produced in the most varied curved shapes. Hopes are entertained of application to aircraft construction, where its low specific gravity would be a strong point in its favor.

Rubber

Dixie Junior, product of R. T. Vanderbilt Company, is described as a hard clay which produces a stiff, high modulus rubber mix, almost the same as that obtained from the regular Dixie clay, another product of this company. Rate of cure and aging properties are practically the same, although it is a whiter clay than Dixie, which makes it of advantage in the compounding of white or colored goods. *The Rubber Age* states that it may be used for loading any articles which call for a stiff clay.

Ceramics

In relating his study on the use of ceric oxide as a new opacifying agent, Byron W. Merwin, *Ceramic Industry*, April '35, p214, summed up his findings in this manner:

(1) Ceric oxide acts somewhat similar to silica in a glaze, in that it corrects for crazing.

(2) Ceric oxide may be used as an opacifying agent in glazes, but is not economical as large quantities must be used to get the desired opacifying qualities.

The oxide would probably be much easier to use as a source of ceric oxide than the sulfate, as the sulfate tends to flocculate the glaze due to the ease with which the sulfate breaks down, making the glaze difficult to apply.

Chemical Specialties

The Beacon Co., Boston, Mass., is now offering "Oxylin"—a substitute for glycerine. Chemists of the company have investigated the use of this product in a number of industries in which glycerine is regularly employed and report that the new

product from the manufacturing viewpoint is entirely satisfactory, being both dependable and efficient, in addition to offering substantial economies in raw material costs. Beacon chemists will cooperate with consumers wishing to investigate its possibilities and can be reached at the executive offices at 89 Bickford St., Boston.

Emulsifying Agent

Palsgaard Emulsion Oil is a new emulsifying agent recently placed on the market by James W. Conway, 108 W. 43 St., N. Y. City. Used in connection with a colloid mill, lasting suspensions can be made of cottonseed oil with a water content as high as 67%. Material is harmless, is said to have a food value, and can be employed in an almost unlimited number of cases where an emulsifying agent is required.

Advantages of Boron Trichloride as Refrigerant

The advantages of boron trichloride as a refrigerant in compression refrigerating machines are said to be non-combustibility, non-toxicity and absence of corrosion effects. German Patent 574,562 claims a further advantage in that leaks may be immediately detected, as the boron trichloride forms a mist on contacting moisture due to hydrolysis.

Killing Weeds with Acids

The use of acid solutions as weed-killers is recommended in French Patent 770,858 of '34. The acid or other solution is absorbed on suitable solids. Powdered lignite, treated with 50% sulfuric acid or 30% phosphoric acid, is cited as an example. When phosphoric acid is used, the mass should be preliminarily heated for a short time.

Naphthenic Acid as a Preservative

An ammoniacal solution of the copper salts of naphthenic acid is said to be the basis of a new wood and textile preservative. New product, known as Naphthiol, will be produced to the extent of 2,000 tons a year at the Baku Chemical Factory, in Russia.

Insecticide Basis

Fluorcoumarin as the basis for an insecticide is the subject of E. P. 421, 885. The 4-fluorcoumarin is prepared by passing fluorine, alone or mixed with a diluent such as nitrogen, through a solution of coumarin in an inert solvent such as carbon tetrachloride, and evaporating the solution to yield crystals. Its insect-repellent properties are also noted.

Antimony Fluoride Agent in Mothproofing

Use of antimony fluoride in mothproofing is outlined in B.P. 413,529. Since the slightly greenish tint of chromium oxide affects delicate shades, a method of minimizing or neutralizing its influence by precipitating hydrated antimony oxide with the chromium oxide is also given.

Carbon Dioxide Enters the Jewelry Field

A step into the jewelry field is seen in the use of solid CO_2 in detecting genuine diamonds and pearls from their counterfeits. The true stones emit a rattle or squeak when touched with the solid CO_2. In like manner, M. D. Walker, writing in *Nature*, states that a quartz lens may be distinguished from a glass one.

Metals and Alloys

An English chemist has solved a problem that has engaged the attention of the electro-plating industry throughout the world for nearly forty years by finding a formula which results in any article leaving the nickel or electro-plating vat with a brilliant polished surface said to be superior to any mechanical polish.

Besides effecting a great saving in time and labor in the actual process, the discovery dispenses with the necessity for labor in polishing the goods. It is estimated that production costs will be cut in half. One effect of the discovery is that chromium plating will now become an entirely chemical process, the intermediate stage of "mopping" being eliminated.

Arsenic in Cement Manufacture

For the past four or five years gold has been produced in the northern part of Sweden, from ore that requires a complicated treatment in order to extract the gold. The process used in the extraction released, among other substances, large quantities of arsenic. A large surplus of this by-product has been accumulated and its safe disposal has been a matter of concern to producers. The problem of disposing of this surplus may be solved as a result of the invention of a method of mixing sand, cement and arsenic to form a product which can be used to protect piles supporting piers and bridges.

Calcium Dodecyl Sulfate as Flotation Agent

Tests abroad reveal that calcium dodecyl sulfate is an unusually good flotation agent for sulfide and oxide ores. *Metallborse*, March 30, relates that it is also valuable in coal-grading processes, and tests now being carried on indicate its probable use in separating feldspar from its accompanying mica and quartz.

New Anode

Development of a new anode named "Zam" (zinc, aluminum, mercury) is announced by Hanson-VanWinkle-Munning Co., Matawan, N. J. This new anode is not attacked by either acid or cyanide solutions until the current is applied. This makes it possible to have an anode free from sludge, and therefore can be completely used in a zinc solution.

Improved Method of Borderizing

Supplementing the well-known immersion Borderizing process, the Parker Rust-Proof Company, Detroit, announces a new method of application, SPRA-Borderizing. This is one of the most advanced methods for stabilizing paint finishes on iron and steel, and chemically produces a typical rust-resistant phosphate coating that provides an adherent base for paint, enamel or lacquer. This product makes possible the production of phosphate coatings at lower temperatures and lower concentration than has ever been possible by an immersion process.

Miscellaneous

An interesting and economical process for the manufacture of porous brick is being used by a refractory company in the U. S., according to *"Canadian Chemistry & Metallurgy."* Crude naphthalene is mixed with the clay and on heating is driven off, giving the desired porosity. At the same time, the naphthalene is purified and recovered. The purified naphthalene is sold at a price which pays for the crude product required in the process.

Leather

A U. S. patent granted to Rudolf Sajitz, assigned to Chemische Fabrik Pott & Co., Pirna-Copitz, Germany (patent granted in Germany in 1928) relates to storing of undressed mineral-tanned leather.

Leather Tanning

A process of tanning leather with ferric salts, said to be only a sixth of the cost of the present one, is reported in *The Chemical Trade Journal*. Karl Sturmer, a German chemist, has perfected the method.

Booklets and Catalogs

Chemicals

A80. "Bakelite Information." Bakelite Corp., 247 Park ave., N. Y. City. March issue devoted to an explanation of the use of Bakelite molded as a photo-electric cell case for instrument made by Western Electrical Instrument Corp.

A81. "The Chemist-Analyst." J. T. Baker Chemical Co., Phillipsburg, N. J. April issue contains 12 suggested methods of analyses, and 6 novel laboratory suggestions. This company welcomes research and plant chemists to become regular readers. There is no charge.

A82. "Price List." The Beacon Co., 89 Bickford st., Boston Mass., Jamaica Plain, Post Office. New price list of emulsion specialties and other products.

A83. "Review of the Oil and Fat Markets, 1934." Faure, Blattman & Co., Cunard House, Leadenhall st., London, E. C. 3. This is perhaps the most extensive review that is published anywhere of the international trade in fats and oils and is greatly sought after by all looking for authoritative statistical data.

A84. "Catalin Stardust." Catalin Corp., 1 Park ave., N. Y. City. A booklet with an actual sample of this new cast resin material.

A85. "Columbia Chemicals." Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa. A list of chemicals and a description of the industries in which they are used.

A86. "Alcohol Talks." Commercial Solvents Corp., 230 Park ave., N. Y. City. This month's issue is devoted to the story of making shellac. Company welcomes new readers for this instructive house-organ.

A87. "Quarterly Price List." E. I. du Pont de Nemours & Co., R. & H. Chemicals Division, Wilmington, Del.

A88. "Technical Data." E. I. du Pont de Nemours & Co., R. & H. Chemicals Division, Wilmington, Del. Physical and chemical properties of the new transparent, thermoplastic hydrocarbon resin, RH-35.

A89. "Synthetic Waxes." E. I. du Pont de Nemours & Co., Organic Chemicals Division, Wilmington, Del. A 10-page booklet giving physical and chemical properties of several new synthetic waxes. Suggested uses are given.

A90. "Organic Chemical Specialties." E. I. du Pont de Nemours & Co., Organic Chemicals Division, Wilmington, Del. A particularly fine booklet on textile specialties, wetting agents, special chemicals employed for the cotton, wool, silk, rayon, leather, paper and miscellaneous industries.

A91. "The du Pont Magazine." E. I. du Pont de Nemours & Co., Wilmington, Del. A particularly interesting number is the April issue, containing articles on the story of nitric acid, past and present; the story of the new explosive "Nitramon"; and article by R. T. Ellis on Pyralin for shoe heels; also a very instructive article, "Plant Protection by Painting."

A92. "Nitramon." E. I. du Pont de Nemours & Co., Wilmington, Del. Descriptive of new blasting agent for large diameter drill holes.

A93. "Synthetic Organic Chemicals." Eastman Kodak Co., Rochester, N. Y. April issue deals with "Oxidation-Reduction Indicators."

A94. "Eastman Organic Chemicals, List No. 26." Eastman Kodak Co., Rochester, N. Y. A new price list. Every buyer of chemicals should be equipped with this booklet.

A95. "Givaudanian." Industrial Aromatics Division. Givaudan-Delawanna, Inc., 80 5th ave., N. Y. City. A monthly publication devoted to news on means of eliminating unpleasant odors from all types of goods. Reports on "Nacene" made up for eliminating smells from glue.

A96. "Hercules Mixer." Hercules Powder Co., Wilmington, Del. Describes Hopewell plant where cotton linters are transformed into a valuable chemical product.

A97. "Ceramic Forum." The O. Hommel Co., 209 4th ave., Pittsburgh, Pa. Are you in the ceramic industry? If you are you should read this monthly newspaper.

A98. "The Pioneer." Electro Bleaching Gas Co., Niagara Alkali Co., 9 E. 41st st., N. Y. City. A house-organ that is different. Users of chlorine and alkalies are eligible as regular subscribers.

A99. "Taste and Odor Control." Industrial Chemical Sales Co., 29 W. 39th st., N. Y. City. April issue devoted to notes on Cincinnati's filtration plant; an article on activated carbon by J. Wrench. Every user of activated carbon should receive this new monthly, and this department will be glad to arrange for readers to do so.

A100. "Fixtan for Heavy Leathers," Grasselli Chemical Co., Cleveland, Ohio. Discusses uses of this high grade filling material and color stabilizer of blended tannins, and also compares it to Fixtan A and Fixtan B. Every tanner, leather chemist, etc., should file for future reference.

A101. "Mallinckrodt Chemicals." Mallinckrodt Chemical Works, St. Louis, Mo. May price list.

A102. "Merck Report." Merck & Co., Rahway, N. J. April issue contains in addition to several interesting feature articles a market resume of important fine chemicals.

A103. "Merck Chemicals." Merck & Co., Rahway, N. J. May price list.

A104. "Monsanto Current Events." Monsanto Chemical Co., St. Louis, Mo. April issue features articles by George A. Martin, president, Sherwin-Williams, on paint manufacture; the story of paradichlorbenzene and its use in routing moths, written by General Manager of Sales, J. A. Berninghaus; dry ice by Arthur L. Gardner, Merrimac plant superintendent.

A105. "Dyestuffs." National Aniline & Chemical Co., 40 Rector st., N. Y. City. Users of dyes find this monthly publication indispensable.

A106. "Sucrose Octa Acetate." Niacet Chemicals Corp., Niagara Falls, N. Y. Leaflet describes commercial availability and many possible applications, particularly as an adhesive and plasticizer. Product is a development of the Sugar Institute, Inc., fellowship at Mellon.

A107. "Silicate P's & Q's." Philadelphia Quartz Co., 121 S. 3rd st., Philadelphia. If you wish to keep uptodate on the uses of silicate and related products ask this department to arrange for you to receive P's & Q's regularly.

A108. "Whitcomings." Wishnick-Tumpeer, Inc., 251 Front st., N. Y. City. With the next issue this interesting house-organ will report on new products, new methods, not of Wishnick-Tumpeer alone, but from all possible sources. It is advisable to arrange now to receive "Whitcomings" regularly.

Equipment, Containers, Packaging Equipment

A109. "Aluminum News Letter." Aluminum Co. of America, Pittsburgh, Pa. A monthly report on new uses for aluminum.

A110. "Cooling and Air Conditioning Units." Buffalo Forge Co., Buffalo, N. Y. A 12-page booklet, profusely illustrated, gives complete technical data on suspended and floor types; also information on central conditioning cabinets.

A11. The Brown Instrument Co., Philadelphia. Folder illustrates and briefly describes the advantages of Brown potentiometer pyrometers.

A112. J. P. Devine Mfg. Co., Mt. Vernon, Ill. Condensed General Catalog, No. 105-B describes the very complete Devine line of chemical and chemical process equipment, and also includes 4 pages of charts and tables, which will be of interest to engineers, consultants, plant managers, etc.

A113. J. P. Devine Mfg. Co. A new Petroleum Distillation Bulletin, well illustrated, furnishes data on the variety and size of petroleum refinery equipment manufactured.

A114. "H-O-H Lighthouse." D. W. Haering & Co., 3408 Monroe st., Chicago. A bi-monthly publication dealing with water treatment.

A115. "Inco." International Nickel Co., 67 Wall st., N. Y. City. Spring issue: K Monel—A new alloy that will particularly appeal to those dealing with corrosive problems in the various branches of the industry; an interesting report on filter screen cloth; use of Monel metal in the linseed plant of National Lead.

A116. "Folder No. 1459." Link Belt Co., 910 Michigan ave., Chicago. "Steam Costs Go Down When You Install Link-Belt Automatic Coal Firing."

A117. "Folder No. 1458." Link-Belt Co. "The Heating Plant Pays a Profit When You Install Link-Belt Automatic Coal Firing."

A118. Lukens Steel Co., Coatesville, Pa. Size card shows sizes of rectangular and circular plates produced.

A119. "Metallic Zinc Powder In Industrial Paint." N. J. Zinc Sales Co., 160 Front st., N. Y. City. Will provide industrial paint buyers with the most up-to-date information on this product.

A120. Patterson Foundry & Machine Co., East Liverpool, Ohio. A 4-page leaflet describes new grinding media, Porox 66; also Porox 66 mill liners.

A121. Parker Appliance Co., Cleveland, Ohio. Bulletin No. 39 contains instructions and price list of Parker production tube bender.

A122. The Pyrometer Instrument Co., 103 Lafayette st., N. Y. City. Bulletin No. 60, illustrates and describes a new surface pyrometer embodying advanced features.

A123. "What You Should Know About Fire Extinguishers." Pyrene Mfg. Co., Newark, N. J.

A124. "Review Raymond Pulverizing Installations." Raymond Bros. Impact Pulverizer Co. Takes you on a tour of many industries that have recently installed Raymond pulverizing equipment. Undoubtedly your industry is included.

A125. The Refinery Supply Co., Tulsa, Okla. Circular describes new Gregory test car column for determining gasoline content of natural gas, and gas analysis in field, and operating efficiencies for plants.

A126. Republic Steel Corp., Massillon, Ohio. New S. A. E. Steels specification chart; gives chemical compositions.

A127. Roots-Connersville Blower Corp., Connersville, Ind. Condensate units are covered in Bulletin 260-B14. These units are intended for heating systems and boiler feed service.

A128. "Oil-Ways." Standard Oil of N. J., 26 Broadway, N. Y. City. A monthly that deals with lubricating problems in plants.

A129. The F. J. Stokes Machine Co., Philadelphia. "Process News" is a new house-organ that engineers, consultants, plant managers and buyers of process equipment will find highly instructive and informative. This department will be glad to arrange for C. I. readers to receive it regularly.

A130. "Standard Chemical Stoneware." U. S. Stoneware Co., 50 Church st., N. Y. City. A most attractive and serviceable loose-leaf folder together with a number of specification sheets on jars, tanks, stills and mixers. Other sheets will be released from time to time, and all those in any way connected with the purchase of chemical stoneware should immediately arrange to get this folder at once for filing purposes.

A131. Worthington Pump & Machinery Corp., Harrison, N. J. Self-Priming pumping units.

A132. Worthington Pump & Machinery Corp. Worthington centrifugal pumps, 2-stage volute, type U.

A133. "When a Paper Bag Wins High Packaging Awards—That's News." Bagpack, Inc., Reports on Cyanamid's winning package (silver medal) in the shipping container group of *Modern Packaging's* packaging competition; also illustrates and describes various size Bagpack installations.

A134. "Bagology." Chase Bag Co., 250 W. 57th st., N. Y. City. Buyers of bags or those who could use bags will find this monthly booklet instructive, amusing

A135. "Closure News." General Plastics, North Tonawanda, N. Y. Reports on new closure developments in Durez molded.

A136. Hayward Co., 50 Church st., N. Y. City. Bulletin No. 300 reports on all types of Hayward buckets.

A137. "Packomatic." J. L. Ferguson Co., Joliet, Ill. Regularly appears with latest information on new installations of Packomatic packaging machinery and like all good house-organs includes interesting and instructive news items pertinent to packaging and personalities in packaging.

A138. The Jeffery Mfg. Co., Columbus, Ohio. One hundred and twelve pages of descriptive material of bucket elevator data (No. 565).

A139. "The Art of Piling." Revolator Co., 336 Garfield ave., Jersey City, N. J. Literally describes how you can stretch your storage space to the rafters with the use of portable elevators.

A140. Wilson & Bennett Mfg. Co., 6558 S. Menard ave., Chicago. A new 128-page catalog showing the complete line of modern steel containers, and includes much material of interest to purchasing agents and sales managers.

A review of a new Nitrate of Soda Reference Manual (A142) (Barrett Co.) will be found in the Fertilizer News Section; also a review of Rolls Chemical's 20th Anniversary Number of "Retorts" (A143), in the Heavy Chemical News Section.

Chemical Industries,
New York City.
25 Spruce Street,

I would like to receive the following booklets; specify by number: ....

....

Name ....
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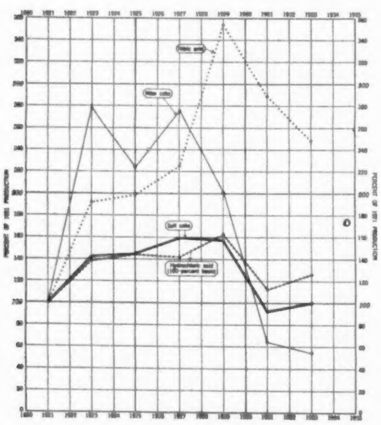
Plant Operation and Control

A Digest of the Current Literature for Makers of Chemicals

Sodium Sulfate— A Review of Methods of Manufacture

By Paul M. Tyler

The U. S. possesses extensive supplies of sodium sulfate in numerous deposits in the Western States, and unlimited quantities could be furnished at fairly low cost in Louisiana and Texas by using common salt and sulfur as raw materials. Additional quantities might be made as a coproduct with potash and magnesium compounds from polyhalite, which occurs abundantly in New Mexico and Texas.



Production of byproduct salt cake vs. hydrochloric acid (100-per cent. basis) and production of niter cake vs. nitric acid, expressed in per cent. of 1921 output as reported by U. S. Bureau of the Census.

Until about '25 supply of crude sodium sulfate or acid sulfate as a byproduct of the manufacture of hydrochloric and nitric acids tended to exceed demand, and accordingly imports and production from natural sources were inconsequential. Growing demand, notably in kraft pulp, developed coincident with a sharp curtailment in byproduct supply due to changes in the processes for making acids. Hydrochloric acid is now made to some extent by direct synthesis from gaseous chlorine and hydrogen, and nitric acid and likewise the nitrous oxides used for sulfuric acid plants, instead of being made from Chile saltpeter, are produced principally by oxidation of ammonia. As new installations at acid plants rapidly replaced the more antiquated processes the output of salt cake and more especially that of niter cake were correspondingly diminished. An impending shortage was averted in part by the exploitation of natural deposits but in greater measure by imports, especially from Germany, where the increased demand from the U. S., Sweden, and other consuming countries was met by converting magnesium sulfate to sodium sulfate by suitable treatment with common salt. Previously, the magnesium sulfate liquor, formed in the processes of production of fertilizer potash, had been dumped into the rivers—not merely a waste but actually a noxious product.

A reasonable assumption is that the demand for sodium sulfate for kraft pulp, glass making, and other uses will continue its rising trend. The extent to which this favorable factor will result in expanding the production of so-called "natural" salt cake will depend, however, upon the balance of other factors, the dominant one being the cost of processing and transporting products of Western deposits to consuming plants, compared with the laid-down cost of the German synthetic product or the Canadian natural product. The issues are clearly drawn, but perhaps only time will tell what share of this expanding business domestic miners can win and hold for their own.

Sodium sulfate occurs in commerce in 3 forms: (1) Anhydrous sodium sulfate, Na_2SO_4, a white amorphous powder containing no water of crystallization; (2) salt cake, a crude form of anhydrous sulfate available in powder or more typically in lumps containing 96% (92 to 99%) Na_2SO_4; and (3) Glauber's salt, $Na_2SO_4.10H_2O$, a crystalline solid containing 55% water of crystallization. There is also another hydrated sodium sulfate corresponding to the formula $Na_2SO_4.7H_2O$. Glauber's salt is produced either as large, transparent crystals (sp. gr., 1.462 to 1.480) or as small needles similar in appearance to Epsom salts. On exposure to air, the crystals lose water and turn to a white powder. Saving in transportation charges favors the use of the anhydrous salt, 44 parts of which are equivalent to 100 parts of Glauber's salt, but the crystalline salt is sometimes preferred because of its readier solubility.

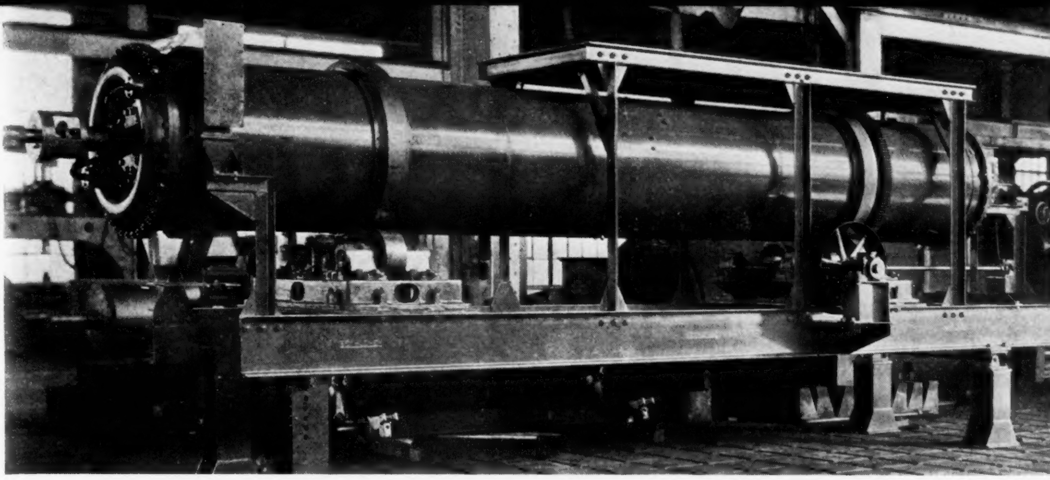
Ordinary commercial sulfate, or salt cake, range in color from yellowish to greenish and occasionally pure white; a dirty gray color indicates contamination by sodium chloride (incomplete decomposition). Generally speaking, the finer the grain of salt cake, the higher the grade. The following chemical analysis is more or less typical of the byproduct grade:

	Per cent.
Moisture	0.24
Silica	.19
Iron oxide	.45
Alumina	Trace
Sodium chloride	2.15
Free sulphuric acid	1.95
Sodium sulfate (by difference)	95.02
	100.00

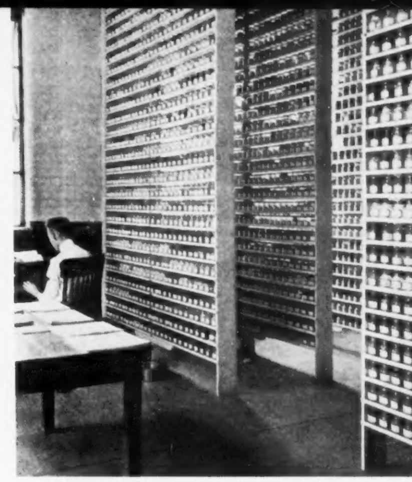
Niter cake, essentially sodium bisulfate (or sodium acid sulfate, $NaHSO_4$), gets its name from the fact that it is the residual product in the manufacture of nitric acid from sodium nitrate (Chile saltpeter). It is employed mainly for its acid content or as a flux but may be a source of byproduct salt cake when mixed with salt to make hydrochloric acid and for certain purposes may be considered a substitute for salt cake. Crude niter cake varies considerably in composition but ordinarily contains 30 to 35% free acid together with minor impurities, so that its anhydrous sodium sulfate content is roughly the same as that of Glauber's salt.

In '27, the consumption of sodium sulfate in all forms was estimated as follows:

Industry	*Short tons*
Pulp and paper	103,000
Heavy chemicals	97,000
Rayon and textile	92,000
Glass and ceramics	45,000
Dye and coal tar	20,000
Soap	2,000
Fine chemicals	1,000
Other	15,000
Total consumption	375,000



Tubular Rotary Dryer specially equipped for research purposes.



The drying results and data obtained from thousands of tests are a valuable aid in the solution of many processing problems.

PRACTICAL RESEARCH

—a solution for many processing problems

RESEARCH directed to improve processing methods is the service which the BUFLOVAK Research Laboratories offer the process industries. Here practical research is employed in the solution of problems involving drying, evaporation, extraction, impregnation, solvent recovery and food processing. The commercial possibilities of a contemplated process are clearly shown by the data obtainable on production costs, capacity and the characteristics of the finished product. Results are definite because each test is conducted on a semi-plant scale on equipment which gives an index of commercial results.

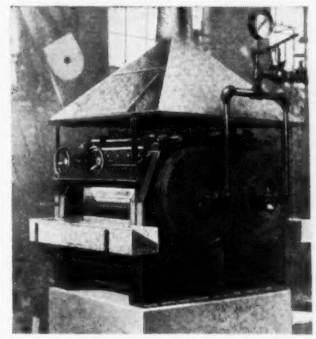
Three thousand six hundred and eleven research process problems have been completed in the past twenty-seven years. They have proved highly valuable to their prospective users, because these tests showed unmistakably, right at the start, what might be expected of the process and what the characteristics of the finished product would be.

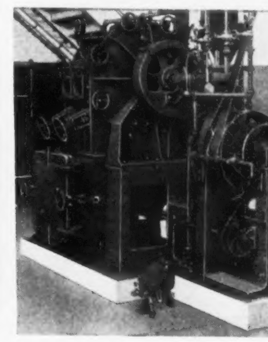
Here all of the different types of equipment are available. Recommendations are based squarely on the results obtainable from the most suitable type equipment, rather than having to adapt a limited number of types to a great many purposes. A highly specialized technical staff will share their mature counsel, guided by their extensive experience.

These and other facilities are at the disposal of any manufacturer with a processing problem. The user's technicians are at liberty to operate the equipment if they desire, and the results are always held in the strictest confidence.

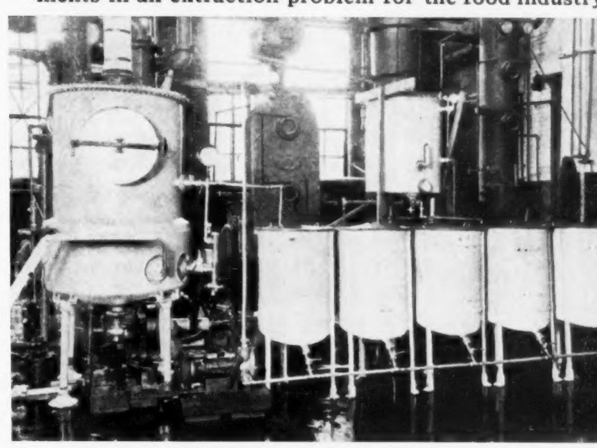
Copies of literature describing BUFLOVAK Process Equipment will be sent on request.

Atmospheric Double Drum Dryer and Vacuum Drum Dryer installed in the research laboratory.

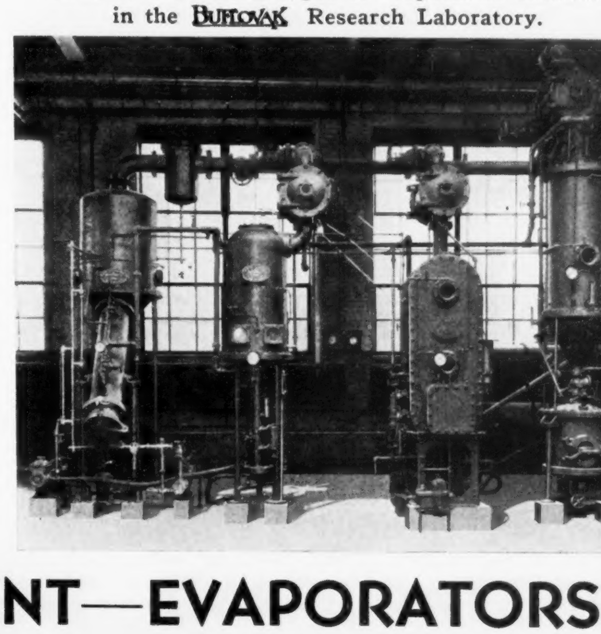




Enameled glass equipment used in conducting experiments in an extraction problem for the food industry



Some of the several types of evaporators installed in the BUFLOVAK Research Laboratory.



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1101 Canada Permanent Bldg., Toronto

DRYERS—PROCESS EQUIPMENT—EVAPORATORS

Corresponding figures relative to salt cake only would indicate a consumption of over 200,000 tons, of which about one third was consumed in the pulp and paper industry, one fourth in the manufacture of heavy chemicals, one fourth in the textile industry (mainly rayon), and the remainder mostly in the glass and ceramics industries. The main use is in the manufacture of kraft paper stock by the sulfate process. Niter cake, formerly regarded as a waste product and subsequently employed as a source of salt cake and as a substitute for sulfuric (in metal pickling, absorbing ammonia, and acidifying phosphate rock), has found some application in making heavy chemicals. It has also been used very extensively in the Oxford process for separating copper and nickel sulfides in the matte made from the ores of the Sudbury district, Ont. Anhydrous sodium sulfate is used in the manufacture of ultramarine and soluble Prussian blue and in glass making, and the natural product is employed for making kraft paper; it also may be employed in making sodium carbonate, in dyeing, as a constituent of freezing mixtures, and in analytic chemistry and medicine. Glauber's salt is used mainly as a mordant in dyeing baths; it is also employed as an assistant in dyeing, in chrome tanning, as a constituent of cattle feed, and to some extent in medicine. A definite trend has developed to replace Glauber's salt with refined anhydrous sulfate, notably as diluent in the manufacture of dyes, because of the cost of transporting the water of crystallization which serves no useful purpose except to facilitate dissolving. Among the heavy chemicals made from the various cruder kinds of sodium sulfate are water glass, sodium sulfide, sodium thiosulfate, and of course Glauber's salt and refined anhydrous sulfate.

Mining Natural Material

Near Camp Verde, Ariz., a flat-lying bed of thenardite 4½ ft. thick is worked through a tunnel in 100-ft. blocks. The salt is drilled with machines and after being shot down is loaded into cars with a hoe-type scraper. The ground stands well, and a little timber is required. Material as mined is contaminated with clay and sodium chloride, which are removed by a 5-mesh cylindrical screen, 25 ft. long, equipped with sprays and employing a saturated sodium sulfate solution instead of water. A drum drier removes moisture, and rolls are employed to crush the sulfate to ¼ inch. A typical analysis of the finished product is as follows: Insoluble, 2.68% ; $CaSO_4$, 1.63%; NaCl, 0.55%; Na_2SO_4, 95.14%. In Utah mining is done in open pits. Deposits of impregnated clays are often worked by alternately flooding and evaporating in ditches and solar pans.

Glauber's salt is the most feasible product to recover from many natural deposits, but as the market for this decahydrate is quite limited it will be necessary in most cases to dehydrate the crystals, obtaining the anhydrous salt.

Manheim Mechanical Salt Cake Furnace

Hydrochloric acid has been made chiefly by the interaction of niter cake with salt (sodium chloride), with the simultaneous production of salt cake. In the U. S. the Mannheim mechanical salt cake furnace has entirely superseded the older pot-and-muffle method (a remnant of the Leblanc process for soda ash), and in other countries mechanical furnaces have likewise displaced the older, laborious, and generally discontinuous operations. Yields of salt cake by this process is slightly greater than the tonnage of niter cake charged. The process may be modified somewhat by adding sulfuric acid and the decreased supply of niter cake, due to the decrease in the use of the retort process for making nitric acid, has hastened the adoption of synthetic processes based upon direct combination of elemental hydrogen and chlorine from electrolytic cells. A fairly large proportion of this domestic output of hydrochloric is even now of synthetic-origin. Hydrochloric is likewise a byproduct of the chlorination of organic materials, chiefly of coal tar origin. All these changes in the hydrochloric acid industry have tended to reduce the output of byproduct salt cake. The Hargreaves process yields salt cake and hydrochloric acid from salt and sulfur dioxide, according to the following reaction:

$$2NaCl + SO_2 + O + H_2O = Na_2SO_4 + 2HCl.$$

This process made considerable progress in Europe several decades ago and has been employed for several years by the Myles Salt Co. in Louisiana.

The manufacture of salt cake and hydrochloric from sulfuric acid and salt has to be conducted in 2 stages, the bisulfate (cf. niter cake) being an intermediate product as indicated by the following equations:

$$(1)\quad NaCl + H_2SO_4 = NaHSO_4 + HCl.$$
$$(2)\quad NaCl + NaHSO_4 = Na_2SO_4 + HCl.$$

The first reaction starts at ordinary temperatures, but the second is only completed at a red heat (but not to exceed 800° C., the melting point of ordinary salt cake). Coarse-grained salt, such as pan salt, and chamber acid (sp. gr. 1.7 to 1.72) are usually employed, and operations at pot-and-muffle plants are described as follows:

> The salt is generally treated in batches of about half a ton, in a large, hemispherical, direct-fired pan, set in suitable brickwork. To the salt an equal weight of sulfuric acid is added. The hydrochloric acid evolved in the decomposing pan is drawn off through a flue in the dome of brickwork covering the pan and is absorbed by water.
>
> The hot mass is then raked into a muffle or reverberatory furnace, and the reaction is completed at a higher temperature. The hydrochloric acid evolved in the muffle furnace is collected separately. When no more vapors are seen rising in the muffle furnace the batch is drawn out and usually left to cool in a closed box in order to avoid the nuisance of obnoxious gases.
>
> The yield of salt cake by this process will vary in different plants, 115 lbs. of salt cake per 100 lbs. of original salt being an average recovery.

Byproduct Niter Cake Production

The largely discontinued process of manufacture of byproduct niter cake is of interest, both as a source of sodium sulfate in the Mannheim process and because it is something of a competitor of salt cake. It is produced in the manufacture of nitric acid from Chilean nitrate of soda and sulfuric; for making 90% nitric acid, high-strength sulfuric acid (90 to 94% H_2SO_4) is required, but for 80% nitric acid, 78% H_2SO_4 (Glover acid) is suitable. By employing quite high temperatures it might be possible to produce anhydrous sodium sulfate and nitric acid, thereby consuming all the sulfuric acid charged, but as this would not be economical it is customary to use more sulfuric acid and conduct the operation approximately according to the following equation:

$$NaNO_3 + H_2SO_4 = NaHSO_4 + HNO_3.$$

The operation is carried on in cast-iron retorts under a vacuum, and when it is completed the niter cake is tapped molten from the bottom of the retorts either into molds or in a stream to be granulated by an air blast.

The German synthetic process for converting waste magnesium sulfate from potash works into saleable salt cake is based upon the equation:

$$MgSO_4 + 2NaCl = Na_2SO_4 + MgCl_2.$$

Common salt is added at suitable temperature and solution control conditions are of course required.

PRODUCTION OF NATURAL SODIUM SULFATES (SALT CAKE AND GLAUBER'S SALT)
(Compiled by A. T. Coons, of the Bureau of Mines)

Year	*Short tons*	*Value*	*Year*	*Short tons*	*Value*
1920	14,851	$221,123	1927	23,080	$168,882
1921	4,900	8,500	1928	6,580	42,485
1922	5,015	36,155	1929	7,540	41,199
1923	10,080	100,000	1930	32,630	206,323
1924	16,200	174,600	1931	32,510	198,132
1925	9,940	84,380	1932	32,204	210,342
1926	19,620	166,800	1933	46,539	245,240

Digested from information circular 6833 of the Bureau of Mines

Plant Equipment

Redwood for Wooden Chemical Vats

Redwood Export Co. of California takes exception to omission of mention of red wood as a material of importance in construction of wooden chemical vats in paper given by W. G. Campbell before the British Chemical Engineering Group. Paper was summarized in the Plant Operation and Control Section of the April issue of C. I., p339.

In an article appearing in the Mar. 30 issue of British *Chemical Age*, salient features of redwood for this purpose are pointed out:

"Chemical industry utilizes a large quantity of redwood for tank purposes, and so varied have been the applications that the characteristics and durability of redwood for storage and process work can be foretold with a reasonable degree of accuracy. In the grouping of storage tanks, beside the usual water storage, are the containers of acid or other solutions. An interesting application of redwood tanks has been made in a large chemical plant that produces aqua ammonia. Slightest impurity in the distilled water in which the ammonia gas is dissolved results in cloudiness of the solution. High solubility of distilled water precluded the use of any metal and a large glass tank was tried without success in avoiding cloudiness in the ammonia solution. Redwood tanks in which the acid content of the wood was neutralized by treating with an alkali permanently solved the problem of the storage of distilled water for ammonia-manufacturing purposes.

"Redwood has proved its value in storing or processing all of the organic acids, including in particular acetic and tannic acid. Former finds wide application in the textile and paint-manufacturing trades and tannic acid forms the basis of an important part of the leather industry. One of the leading paint manufacturers of America, referring to the storage of acetic acid, reported recently: "Strength of this acid has varied from 30% to 80% at normal temperatures. We have not noted that the acid had any ill-effects on the wood, in fact, we believe that acetic acid could be stored almost indefinitely in redwood."

Long Life But One Advantage

Where redwood tanks have been used in tanning leather, it is not uncommon to find such tanks lasting for more than a half-century. A recent inspection of tanks in a tannery revealed them sound after 40 years, even though subjected to a 5 hours' daily boiling of the contained tannic acid solution. Similarly, redwood tanks are in all respects suited to the production of the esters, the principal applications having been in commercial production of the vegetable and animal fats and oils. An analogous use, but failing within consideration of the inorganic acids is that of "soap-stock" tanks. Notwithstanding the severe effect of the boiling of the vegetable and animal greases in the presence of sulfuric acid, "soap-stock" tanks of redwood last for many years. Failure, when it occurs, is caused by a charring of the tank bottom boards under the combined influence of the boiling acid solution and the steam coils located immediately above the bottom boards. Use of redwood tanks for boiling water, even with steam coils adjacent to the bottom, is to be favorably distinguished from hot acid solutions. A redwood tank lasts indefinitely long and gives perfect satisfaction when used in contact with boiling water.

The inorganic acids as commercially employed may also be used with redwood, although limitations must be observed with respect to those that are strong oxidizing agents, among which are grouped nitric and chromic acid and free chlorine solutions. Strong concentrations of sulfuric and hydrochloric acids, particularly at high temperatures, affect all woods detrimentally, although weaker solutions, in some cases up to 10%, may be used and a satisfactory durability obtained. There is the same wide difference of opinion with respect to the most suitable wood for acid work as obtains with the various acid-resisting metals, but redwood has given excellent results in a wide variety of applications of the inorganic acids. Aside from consideration of oxidizing effect the *p*H value of any inorganic acid offers an index of the corrosive action on wood of any acid as such. Potassium and sodium cyanide as employed in metallurgical operations are without action on redwood. Leaching, agitator and storage tanks for use with acid solutions of copper sulfate are standardized redwood equipment throughout the major mining plants of the world. Action of the copper sulfate is superficial only and affects but the inner surface in immediate contact with the solution."

Fine Chemicals

Production of Calcium Gluconate

A cheaper and faster method for making calcium gluconate is reported recently before the A. C. S. in N. Y. City by chemists of the U. S. Dept. of Agriculture. Discovery is based upon a more efficient use of molds as fermentation agents. Molds have been used for centuries in the manufacture of Roquefort and Camembert cheese, and more recently for making citric and gluconic acids.

Six years ago Herrick and May discovered a mold that produces gluconic acid from glucose or corn sugar. This acid is important in the manufacture of calcium gluconate, which until that time sold for about $150 per lb. When this pure-culture mold was put to work making gluconic acid the rare chemical could be made for 50c a lb. Improved process now cuts the cost still more.

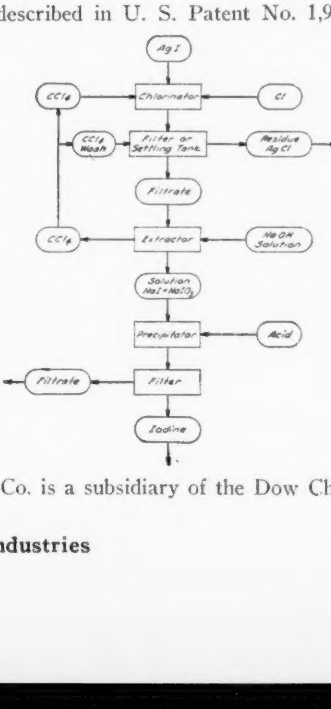
Because molds must have air—the same as most other forms of plant life—chemists grew them on the surface of shallow pans in the laboratories of the Bureau of Chemistry and Soils, at Arlington Farm, Va. Method can be adapted to commercial use but the necessity of using large pans has been a decided handicap in large-scale operations.

To offset this handicap, scientists set out to find some way to make the molds grow beneath the surface, as yeasts do in the manufacture of alcohol. Result is a rotating drum equipped with paddles on the inside of the drum—somewhat like a rotary churn. Air is forced into this drum under pressure through one end, and is removed through the other end.

Tests over several months show 3 important advantages of the new method for making gluconic acid. With the rotating drum, 10 lbs. of sugar yields 8 lbs. of gluconic acid, compared with 5½ lbs. when pans are used. Time required is only one-fifth of that formerly needed.

Recovering Iodine

A method for the recovery of iodine from silver iodide is described in U. S. Patent No. 1,994,416, taken out by Charles W. Girvin of Long Beach, Calif., and assigned to Io-Dow Chemical and consists essentially of chlorinating the silver iodide while suspended in a liquid medium consisting of a chlorinated aliphatic hydrocarbon non-reactive with chlorine at temperatures below the boiling point of the chlorinated hydrocarbon.



A flow-chart of the process, as outlined in the patent application, is reproduced.

The Io-Dow Chemical Co. is a subsidiary of the Dow Chemical Co. of Midland, Mich.

New Mold for Sarcolactic Acid

Another mold has been harnessed and put to work. Chemists Ward, Lockwood, May, and Herrick of the Bureau of Chemistry and Soils, report to the A. C. S. progress in development of a process for manufacture of a pure form of sarcolactic acid.

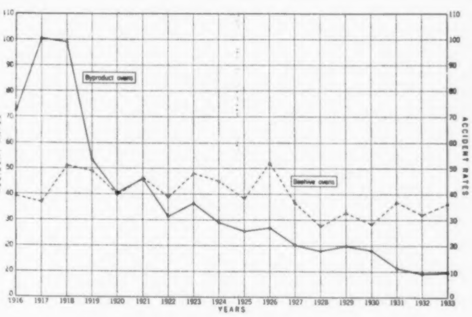
Pure Hydrofluoric from Fluospars

Manufacture of pure hydrofluoric acid from fluospars containing up to 10% of silica is reported by F. Schuh in a recent issue of *Chemiker-Zeitung* (Mar. 20, '35). The lower the silica content the higher the purity of the acid. Details of production are not given.

Coal-Tar Chemicals

Safety Record in Coking Operations

Coke-making industry established a safety record in '33 almost equal in merit to that which it achieved in '32, when the accident-frequency rate was the lowest and therefore the most favorable that the industry has known. Credit for the achievement is due almost entirely to companies operating byproduct ovens. Employment conditions improved in '33 as compared with '32, both as to the average number of men working at the ovens and as to the aggregate number of man-hours of work performed during the year. The number of men employed was 13,598; this represented a gain of more than 13% over the previous year. Total employment or exposure to risk amounted to 37,213,766 man-hours, an increase of 12% over '32. Accidents to the men while at work resulted in the death of 11 employees; in addition, 388 men were injured, an injury being considered as any that disabled an employee for more than the remainder of the day on which the accident occurred. The 11 fatalities represented a rate of 0.30 per million man-hours of exposure to risk; the 388 injuries represented a rate of 10.43 per million man-hours. These rates indicated an improvement over the record of the preceding year, when the fatality rate was 0.42 and the injury rate was 9.63. Complete report contains a wealth of statistics. Report of the Bureau of Mines, No. 3273.



Accident rates, showing number of injuries and deaths per million man-hours of employment at coke ovens in the United States

Solvents

Suggested Fields of Development in Solvents

Dr. Otto Jordan points out in an address before the British Oil and Colour Chemists' Association that the development of cellulose acetate had been retarded among other reasons by 2 problems in the solvent field. In the first place, there was lacking a solvent of medium volatility, and secondly, plasticizers with improved properties were needed. As far as the first reason was concerned, it had not so far been possible to manufacture a uniform, cheap and harmless medium boiling solvent for cellulose acetate. There had been more success, however, with plasticizers because by introducing chlorine or ether groups into the molecule of some water insoluble plasticizers, particularly those of the aliphatic series, good results had been obtained in Germany, and further research work, with a decrease in cellulose acetate prices, should result in further application of this cellulose ester.

During his discussion of the latest developments in the solvents industry the speaker pointed out an example of what might possibly be done with stoving enamels was provided by Henry Ford who, by changing his motor car lacquering to synthetic stoving enamels, had obtained better weather resistance at a lower cost. In addition, the sanding and polishing processes were omitted, and although there had been some objections to this kind of finishing of motor cars Dr. Jordan said that having visited the Ford plant he felt that Mr. Ford had again proved himself a pioneer, because what was being done would stimulate competition in the lacquer industry and assist further progress in producing better materials.

Speaker also reviewed development of chlorinated rubber and the need for special solvents and plasticizers in this field; that there are now available different types of plasticizers to choose from—particularly liquid chlorinated diphenyls and high molecular substituted condensation products of cyclic hydrocarbons, known as T oil. In addition, excellent results had been obtained by using in certain proportions, oil modified phthalate resins. There was no doubt, the speaker reported, that in addition to chlorinated rubber, some vinyl resins such as polystyrol would find important fields of application, also to benzyl cellulose and cellulose acetate.

New Method for Producing Benzine

An English chemist, according to the *N. Y. Journal of Commerce*, claims to be able to produce benzine from argillite much below the cost of the imported product, according to trade correspondence from abroad. Process, officially approved, is said to be ready for exploitation. At a temperature not exceeding 500°C., the slate is transformed into a distillable liquid, and the subsequent distillation carried out by one of the usual methods. Experiments with argillite from Var, France, yielded 315 liquid liters per ton slate. However, the highest yields are said to have been attained with "torbanite," an Australian slate.

Plant Management

Chemists As Purchasing Agents

Purchasing would seem to have been made to order for the chemist, yet others largely occupy such positions. Reason would appear to be that a person with chemical training becomes also one who does not readily do anything else but chemical work; whereas most of the men employed in purchasing were never particularly trained in anything, unless it were office detail. More recently, and in a certain number of cases, they have given themselves an amazing education, but they did not go to universities to become purchasing agents.

And yet frequently chemists bewail lack of opportunity. The first thing a chemist should really decide is whether or not he desires to work at chemistry.

This is not intended for the individual who is really a chemist or chemical engineer and is content to function as a circumscribed specialist. But it is rather the remainder, who forever desire to use chemical training and some experience as a stepping-stone to something else, who frequently fail so miserably. The microscope was a splendid invention, but it does not help the average fellow to see the horizon any better than he could with his own eyesight. If chemists desire to become purchasing agents and salesmen, or if they wish to take on the responsibility for production and plant management, they must show a natural aptitude toward self-training and adjustment. They must show ordinary sagacity in human relationships, and a willingness to pick up a wide range of simple informative facts.

Some do this with ease, others with difficulty. Frequently non-chemists have brains enough to see that they might perform in splendid fashion. Weaknesses in the chemist's armor are quickly detected. A chemist may spend most of his life

waking up to many things that an office-boy learned between 14 and 18 years of age. Chemists, too, are usually so ignorant of the business aspects of the industries with which they are associated that they have no opportunity really to know what is going on about them. They could correct by doing a little research into the affairs of their own company and by studying industrial history and economics.

Absolutely terrific have been the battles in the past between chemists and plant superintendents, between those who think and the rule-of-thumb operators. Much of that day has been won. But a further step is recommended, namely, excursions which for many will close the doors of the laboratory except for visitation and will end in the purchasing department. Purchasing is emphasized because more people can learn to buy than will ever be able to sell. Purchasing agents may either smile or snarl and still do a fair job. They must be particularly honest-minded fellows, with a natural analytical bent. Their stock-in-trade is an accumulation of experience and data, an enquiring mind that does not overlook detail, and finally the power of decision. It usually does not take much calculus to be a purchasing agent, but it does require some good arithmetic. The average purchasing agent requires a chemist to assist and guide him when anything really important, difficult or beyond common-sense deduction must be done. The suggestion is made here, quite boldly, that there are more young chemists who could quickly become good general purchasing agents than there are purchasing agents who could do or think their own chemistry.—*Canadian Chemistry & Industry*, March 1935, p. 44.

Research

Suggestions for Training Chemists

Thomas Donaldson in an address before the Glasgow Section, Society of Chemical Industry, criticized present training of industrial chemists, pointing out 4 years were required for the first degree plus 3 years for doctorate, bringing the young man out at about 24 years of age looking for a place in industry. A further period of 2 years is required before the man becomes an efficient member of the profession. His suggestion is a 3 year preliminary course after which the man should choose between a technical career or a 2 years training in industry which would fit him to be an efficient technical salesman. If he decided to remain on the technical side he had 2 alternatives. He could complete his honors degree and do one year's post-graduate research, or he could take a 2 years course in applied chemistry. On this matter of starting research, Mr. Donaldson said that it is far more important that students should be trained in the methods of research rather than that they should solve any particular problem.—Digested from a summary in *Nature*, British, Mar. 9, p. 369.

The Sphere of the Technical Staff

Most American industrial concerns are now driving a 2-horse team. Dark horse in the race for competitive advantage is technical research seeking new markets, developing new applications, reducing production costs, bringing luxury items within the reach of lower income levels. White horse, market or customer research, to find new things which can be built at a price is presented to the technical staff as a challenge to utilize resources of science, new materials, new methods of fabrication to coax the dollars into circulation.

Consumer's stake in research is of increasing significance and importance in these highly competitive times. Consumer is using the weapons of science and technology in defensive tactics against distress and low quality merchandise. An important feature of the service of technical research in marketing is the technical service of solving the other fellow's problem, finding out by scientific specification exactly what he wants and going back to the technical staff of the research laboratory and placing the burden upon them of producing what the customer wants.

The industrial research laboratory is sometimes called "The Looking Ahead Department" of a company; but marketing research directs the attention of company officials of what to look at—in specific terms of human needs.—Maurice Holland, director, division of Engineering & Industrial Research, National Research Council.

The Laboratory

Tellurium Content of Chemical Lead

A suggested method for the determination of tellurium content of chemical lead is summarized as follows: About 20 grams of the sample are dissolved in dilute nitric, solution boiled until all the nitrogen oxide fumes have disappeared. Then 5 to 10 c.c. of bromine water are added to the solution. This oxidizes any residual nitrogen oxides, and excess of bromine is removed by boiling. Solution is then concentrated until lead nitrate crystals commence to appear. Cooled solution is now diluted with water to a volume of from 500 to 600 c.c., and titrated cold with N/50 potassium-permanganate solution. One hundred c.c. of this standard solution corresponds to 0.102 grams of tellurium, and the color change at the end of the titration is quite a distinct one to the usual red violet. It is also quite feasible to use a N/100 permanganate solution. Method is suitable for alloys with a tellurium content of about 0.05%. For richer alloys it is essential to ensure that the solution being titrated does not contain more than 0.05 gram of tellurium. During the oxidation, manganese is precipitated as the yellowish oxide, but this does not interfere with the determination of the end point.—*Chemiker Zeitung*, Mar. 23.

Agricultural Chemicals

Niccoli Process of Potash Extraction

The Soc. Italiano Potassio Marino has developed, with assistance of the Italian Government, the so-called Niccoli process of extracting potash salts from concentrated sea brine. It is operated on a commercial scale at Massaua, on the Red Sea, in conjunction with the Erythrean salt works, and experimentally near Naples. Starting with a brine solution from salt pans, a concentrated brine is obtained by solar evaporation. This, it is alleged, can be processed to yield kainite or potassium-magnesium sulfate, with sodium chloride and magnesium chloride as co-products.—*Chemical Age*, British, Apr. 20, p. 346.

Catalysts

Alumina Catalyst for Hydrocyanic Acid

A catalyst has been developed for the production of hydrocyanic acid from carbon monoxide and ammonia. Catalyst consists of alumina, specially prepared in splinter form and activated by zirconium oxide.—*Industrial & Engineering Chemistry*, April, p410.

Hydrogenation Catalysts

Oxides of platinum are suggested as hydrogenation catalysts. Researchers report the dioxide 2 to 3 times more effective than ordinary platinum black in hydrogenations of the double bonds of $C = C$ and $C = O$ groupings.—*Comptes Rendus*, Feb. 4.

Miscellaneous

Cymene Production Method

Process for producing Cymene utilizes pinene which is agitated in solution with bromine, the solvent evaporated off on completion of the reaction and the heated product debrominated in the presence of 2% catalyst, usually iodine. A 50% yield is reported.—*Bull. de la Soc. Chimique*, Nov., '34.

New Equipment

Colloid Mills To Order — Q C 240

Custom-built colloidal mills. Each mill designed specially for one particular job. Colloidal chemistry for many years was treated simply as one small division of the larger grouping-physical chemistry. Within the past decade, however, a great deal more attention has been paid to the development of colloids and a proper understanding of the principles involved. Within the past few years the progress in the design of colloid mills has been at a very rapid rate. Hand-in hand with this improvement has gone the advances in emulsifying agents. Colloidal mills are employed in over 200 different industries. For the production manager who is laboring with the problem of suspensions, a Long Island City manufacturer offers unique engineering services in designing a mill that will, they promise, solve all difficulties.

A group of 500 colloid mills designed specially for introducing vitamin D concentrate into foods.

Liquid Mixer — Q C 241

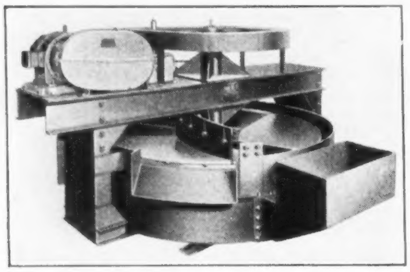
A newly designed motor driven change can liquid mixer of 135 gal. capacity is available with a number of exclusive engineering refinements. It particularly lends itself to the operation of thinning down pastes.

A Flat Sprayer — Q C 242

First small sprayer, with cup attached and without a needle, to have a flat spray is available. A specially designed nozzle flattens out the spray, enabling it to cover large areas evenly and in much less time than with the ordinary "Round Spray."

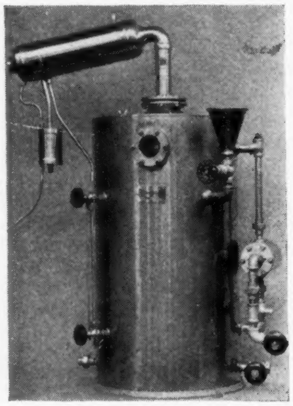
Dewatering Rotoscoop — Q C 243

Following reports of satisfactory performance of the several machines built and placed in service, dewatering rotoscoop is now announced as a perfected device for recovering fine or coarse sand and similar material. New machine fills the need for a sand dewatering device capable of recovering the available sand grains, of sufficient fineness to meet specifications, and discharging the product dry enough to permit truck transportation, or mechanical conveying to and from storage. It is suitable also for treating other materials besides sand, and provides a simple method of saving special grain sizes which were formerly lost in the overflow water.



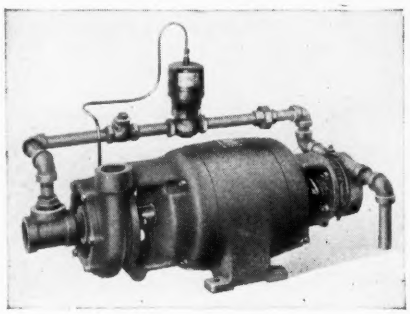
Small Solvent Recovery Still — Q C 244

A new type of solvent recovery still permits users of small or moderate amounts of solvents to recover them in their original purity and use them again and again. In certain plants it is claimed that the savings effected in this way paid for the new equipment in 2 months. Solvents recovered are varied in use and nature; some of the more common being carbon tetrachloride, trichlorethylene, ethyl acetate, ether, alcohol, pentachlor-ethylene, acetone, toluol, benzol, naphthas and others. The new solvent stills are available for either continuous or batch operation, in a full range of capacities. They may be heated by steam, gas or electricity as desired. Because practically every problem in solvent recovery is different, these stills are more or less made to order of the materials best suited to particular requirements.



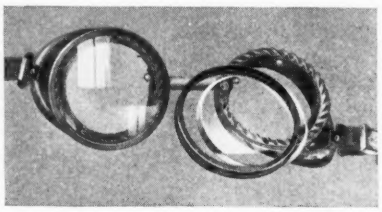
Self-Priming Pump — Q C 245

A truly dependable pump that will unfailingly prime itself when necessary has long been sought for sumps, numerous industrial plant services, etc. Problem has been solved through the use of a positive primer, placed on the same shaft with the motor and pump. Only requirement is a reasonably tight suction line. There are no floats. Nor are there valves to set or give trouble. Priming apparatus has been exhaustively tested for 10,000 starts, equivalent to more than 30 years of operation.



Chemical Plant Goggles — Q C 246

A new goggle, effectively ventilated but giving protection from splashes of dangerous liquids and the impact of flying particles, is announced. Goggle is called AO Duralite-50 Chemical Goggle. Eyecups are molded to fit snugly to the contour of the face and so prevent liquid from entering around the goggle. Air circulates through slots in the lens rings, through the radial slots in the eyecups and through the perforated side shields. A solid baffle plate in back of the side shield is flared out on the edge nearest the lens, permitting air circulation but isolating the eyes from splashes.



Chemical Industries,
25 Spruce Street,
New York City.

I would like to receive more detailed information on the following equipment: (Kindly check those desired.)

Q C 240	Q C 244
" 241	" 245
" 242	" 246
" 243	

Name ....

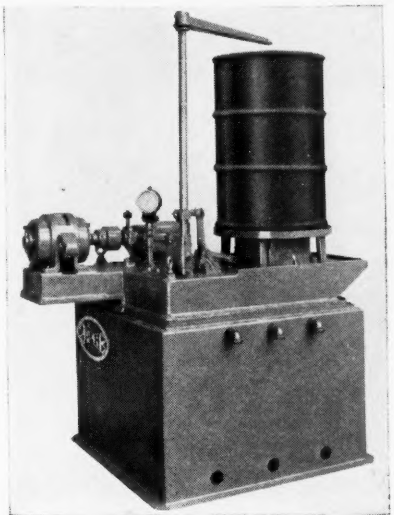
Title ....

Address ....

Packaging, Handling and Shipping

¶New Suggestion for Reconditioning Drums—A Packer Suitable for Chemical Powders—Saving Space in Packaging—A Welded Storage Rack—

Reconditioning of returnable containers used for bulk shipments of chemicals is greatly simplified by a new barrel renovator. Using the principle of the beer barrel renovating equipment which this company has manufactured for over forty years, this machine cleans barrels inside and out at a minimum of time and expense. Cleansing solution, either hot or cold, is force sprayed against the walls by means of a revolving spray nozzle. In the form of a sheet, this revolving spray under a pressure of 50 lbs. has a scouring effect throughout the interior of the barrel, dislodging all materials and washing it down before rinsing and drying operations. Actual time on the spindle rests with the action of the solution on the material to be removed, with average time between 1½ and 2 minutes. Residue flows back to the 70-gal. pot where waste materials are removed to permit continuous pumping of the cleansing solution.

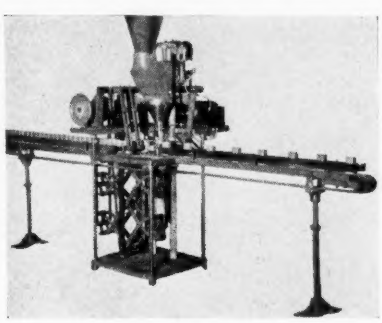


Making a difficult job easy—a new machine for drum washing

Machine handles barrels of various sizes in either horizontal or vertical position, uses any type of solvent solution.*

New Linomatic Packer

An automatic packer, well-suited for packaging cleansers, soap and chemical powders, attracted attention at the recent Chicago Packaging Exposition. Features are: Quick action oil clutch in leak-proof housing; dust-proofed ball bearing pivots in movements of levers; combination mechanical and electric trip—no pitting of contacts—not affected by vibration; one-piece steel augers. Production, 30 to 60 per minute; one attendant. Automatic controls insure stopping of feeder if no can is in position.*



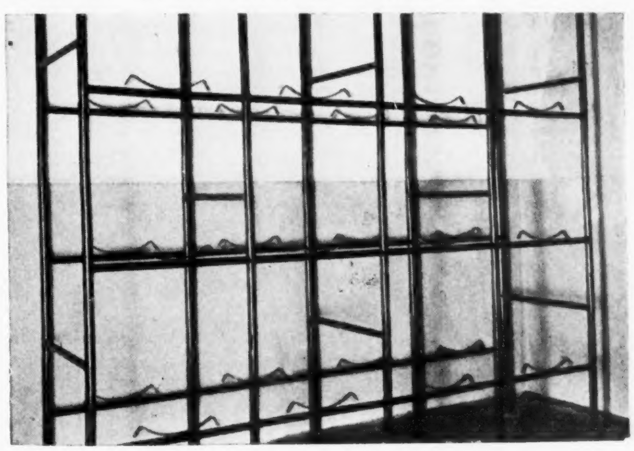
Compact Strap Retainer

Where space is at a premium a new strap retainer adapted for use with conveyor systems or strapping tables is solving the problem satisfactorily in a number of plants. Coil of strapping lies in a horizontal position on a steel pan which may readily be moved as it is built on casters. Pan can be placed under the table out of the way of the operator.

Actual tests of operations where this movable pan has been used indicate that there is no likelihood of any interruptions in the feeding of the strapping to the machine.*

All-Welded Barrel Storage Rack

In the April issue of *Oxy-Acetylene Tips* (Linde Air Products) is the suggestion of an all-welded barrel storage rack. By laying inexpensive shelving smaller containers can be stored.



An novel all-welded storage rack for drums

The actual cost, according to the figures given in the article "Space at a Premium," was less than half that of other fabrication methods.

With the Container Companies

W. I. Frost, Stokes Machine West Coast representative is now at 524 S. Spring st., Los Angeles.

Wackman Welded Ware will enlarge H. H. Ward steel drum plant at Chester, Pa., recently purchased.

Robert Gair Co. acquires London Shipping Containers, Ltd., of London, Ont., and of Canadian Containers, Ltd., of Windsor. Acquisitions mark the further extension of Gair interests in Canadian paperboard industry.

Metal Package Corp., one of America's largest canmakers, will hereafter be known as National Can Co.

Wilson & Bennett buys Ohio Pail of Middlefield, Ohio.

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* This Department will gladly supply C. I. readers with the name of the manufacturer.

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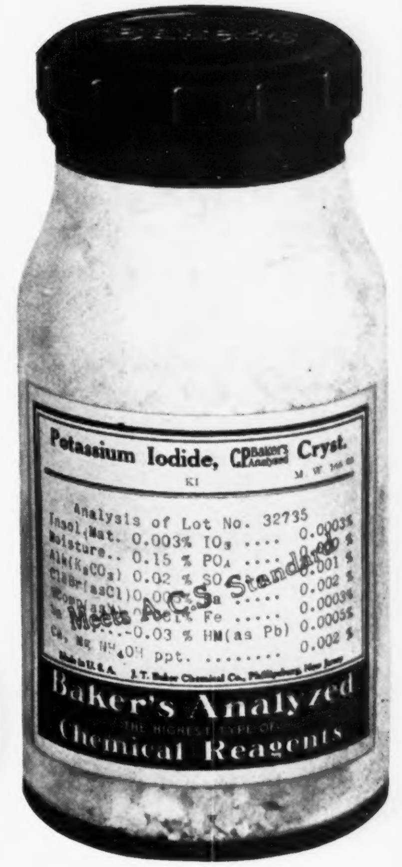
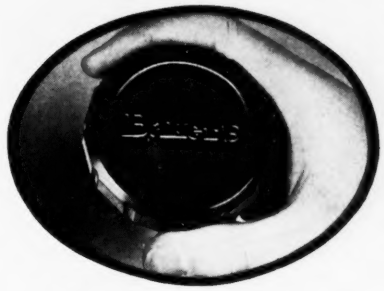
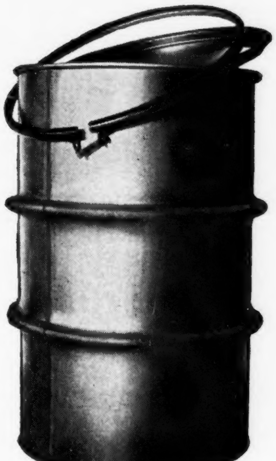
A "family" of packages recently designed by Brooks & Porter for the Mothozone Co. which has received very favorable comment. Designs leave no doubt in the consumer's mind as to the type of product and its purpose. Cans are by Continental Can; canisters by The Canister Co.



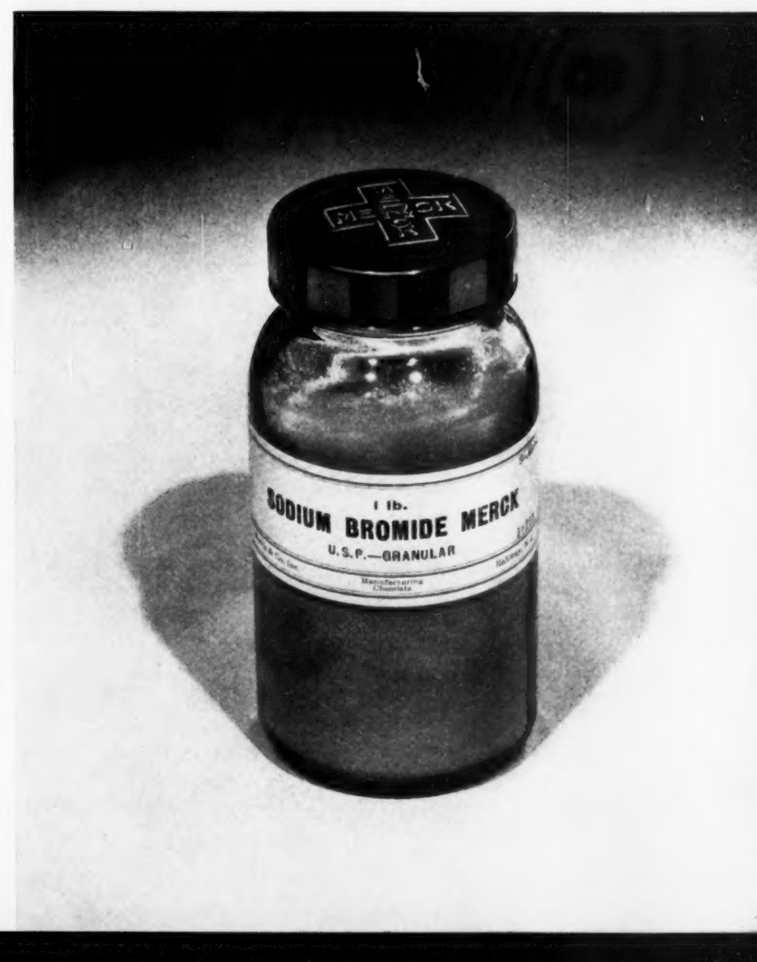




Pittsburgh Steel Drum develops a full-removable-head I. C. C. 5-E drum. Packaging engineers are enthusiastic about several of its features, and a number of chemical companies and others in closely allied industries where drums are used are investigating.

Two outstanding producers in the fine chemical field, J. T. Baker Chemical Co. and Merck & Co., after exhaustive tests, adopt the plastic closure for their reagents and C. P. and U. S. P. Chemicals. S. W. Burnham, Merck & Co.'s packaging expert, sums up the advantages of the plastic closure when he says, "They are easy to remove and replace, are permanent, and prevent dust from settling around the lip of the bottle—a condition usually encountered with the old style cork-stoppered container."

Nation-wide distribution of a new furniture polish developed and manufactured by the Three-In-One Oil Co., as a companion product of its widely sold household oil, has been announced. Bottle was designed by Hazel-Atlas Glass, executed by Owens-Illinois Glass; labels and carton designed by Thompson-Koch Co.



U. S. Chemical Patents

A Complete Check-List of Products, Apparatus, Equipment, Processes

Agricultural Chemicals

Process treating evergreens with a dilute solution containing sodium metaphosphate. No. 1,991,850. Ralph E. Hall, Mt. Lebanon, Pa., to Hall Laboratory, Inc., Pittsburgh, Pa.

Production parasiticide derived from higher alcohols. No. 1,993,040. Paul L. Salzberg and Euclid W. Bousquet, Wilmington, Del., to Grasselli Chemical Co., Cleveland, O.

Cellulose

Preparation wood cellulose for the manufacture of cellulose solutions or plastics. No. 1,991,786. Hedwig Busch, Mannheim, Germany, to Zellstoffarik Waldhof, Mannheim, Waldhof, Germany.

Production hydrogen sulfide from artificial silk waste of cellulosic origin. No. 1,992,896. Rudolph S. Bley, Elizabethton, Tenn., to North American Rayon Corp., New York City.

Treatment filaments of organic esters of cellulose; by application of a saponifying agent. No. 1,992,259. Wm. Ivan Taylor, Spondon, near Derby, England, to Celanese Corp. of America, a corporation of Delaware.

Production a cellulose ester plastic, containing a neutral, colorless, odorless phosphite ester of cyclohexanol. No. 1,993,723. Lucas P. Kyrides, Webster Groves, Mo., to Monsanto Chemical Co., St. Louis, Mo.

Improved method of manufacturing cellulose acetate. No. 1,993,782. Clifford I. Haney, Drummondville, Que., Canada, to Celanese Corp. of America, a corporation of Delaware.

Preparation clear solution consisting of cellulose acetate, ethylene chloride, and trichloro tertiary butyl alcohol. No. 1,994,597. Cyril J. Staud and Louis M. Minsk, Rochester, N. Y., to Eastman Kodak Co., Rochester, N. Y.

Process bleaching derivatives of cellulose. No. 1,994,985. Camille Dreyfus, New York City, and Geo. Schneider, Montclair, N. J., to Celanese Corp. of America, a corporation of Delaware.

Preparation composition containing an organic derivative of cellulose and a sulfonamide of an ether of phenol as plasticizer. No. 1,995,015. Geo. W. Seymour, Cumberland, Md., to Celanese Corp. of America, a corporation of Delaware.

Preparation composition containing cellulose acetate and α naphthalene sulfonamide as plasticizer. No. 1,995,016. Geo. W. Seymour, Cumberland, Md., to Celanese Corp. of America, a corporation of Delaware.

Manufacture cellulose nitrate wherein cellulose is nitrated, the excess acid removed, and the resulting cellulose nitrate purified by boiling with dilute acid or by other purification or stabilization means. No. 1,995,117. Roderick K. Eskew, East Orange, N. J., to Du Pont Viscoloid Co., Wilmington, Del.

Chemical Specialties

Production germicide, containing as its active ingredient an acidic oily liquid. No. 1,991,590. Wallace J. Yates, Martinez, Cal., to Shell Development Co., San Francisco, Cal.

Waterproofing and polishing compound for wood; impregnating wood with a compound consisting of a waterproof varnish, a wax, and a drying oil. No. 1,991,752. Harvey G. Kittredge, Dayton, O., to Kay & Ess Chemical Corp., Dayton, O.

Premixed waterproof composition for flooring, etc.; comprising a uniform mixture of fibrated stable bituminous dispersion, aggregate of 20 to 80 mesh, and inert finely divided material of 100 to 200 mesh. No. 1,991,755. Harold L. Levin, Nutley, N. J., to Patent & Licensing Corp., New York, N. Y.

Production an anti-freeze fluid; being an aqueous solution of tetrahydrofurfuryl alcohol. No. 1,992,469. Robt. W. Cairns, Balto., Md., to Firestone Tire & Rubber Co., Akron, O.

Production liquid cooling medium for use in conjunction with a metal radiator; using an alcohol and an acid salt. No. 1,992,689. Henry L. Cox, Charleston, W. Va., to Carbide & Carbon Chemicals Corp., New York City.

Production a detergent and its application. No. 1,992,692. Leonard H. Englund, Winnetka, Ill., two-thirds to Benjamin Baslaw and one-third to Chas. N. Ash, Chicago, Ill.

Paint, varnish and lacquer remover, also suitable for cleaning metal; a rust inhibitor; and a degreasing agent, containing as an essential ingredient "floating soap." No. 1,993,096. Paul Hodges, Tuscaloosa, Ala., to Gulf States Paper Corp., a corporation of Delaware.

Method sealing or joining moisture-proof materials; using an adhesive containing gum manila and castor oil. No. 1,992,190. Wm. Hale Charch, Buffalo, and Jas. E. Snyder, Kenmore, N. Y., to Du Pont Cellophane Co., Inc., New York, N. Y.

Production stencil sheet; coating a porous material with an ammoniacal copper solution of fibroin, castor oil, and saponified beeswax. No. 1,992,202. Abraham P. Furman, Bronx, N. Y., to Ira Furman, Charlotte, N. C.

Manufacture a disinfectant soap, which contains silver subchloride. No. 1,993,686. Wilhelm Schulenburg, Frankfort-am-Main, Germany, to Deutsche Gold- und Silber-Scheideanstalt vormals Roessler, Frankfort-am-Main, Germany.

Etching composition consisting of water, copper sulfate, salt, and gelatine. No. 1,993,920. Frank Costa and Candido Munumer, New York City.

Prevention damage by termites; first step being treatment ground with a solution of a water-soluble salt of copper. No. 1,994,752. Asa C. Chandler, Houston, Tex.

Preparation polishing composition; containing free unsaponified wax acids of the carnaubic and Montanic groups, also other wax-like substances and emulsifiers. No. 1,995,219. Louis Friedrich Wilhelm Pape, Dusseldorf-Benrath, Germany, to Henkel & Cie, Gesellschaft m.b.H., Dusseldorf, Germany.

Preparation insect repellent comprising substituted product of cumarin. No. 1,995,247. Berthold Gunther Haring, Valparaiso, Chile, to Hermann Wilhelm Haring, Gerbstedt, Germany.

Coal Tar Chemicals

Production a, a-anthracene-dicarbonyl-chloride. No. 1,991,688. Ralph N. Lulek and Melvin A. Perkins, Milwaukee, Wis., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Process separation mono- and di-alkylamines of the benzene series; by treatment with phthalic anhydride in the absence of inert solvents, and final treatment with aqueous alkali. No. 1,991,790. John Belmont Cook, Jr., and Donald Hutton, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Preparation aminic acids. No. 1,991,787. Paul Whittier Carleton, Penns Grove, N. J., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Production an intermediate suitable for production of artificial materials; bringing a condensation product of a urea and an aldehyde into contact with a sulfur derivative of glycerine. No. 1,991,810. Leon Lilienfeld, Vienna, Austria.

Process making benzene from light oil. No. 1,991,843. Robert W. Campbell and Fred. W. Wagner, Pittsburgh, Pa., to Jones and Laughlin Steel Corp., Pittsburgh, Pa.

Process making chemically pure benzene. No. 1,991,844. Robert W. Campbell and Fred. W. Wagner, Pittsburgh, Pa., to Jones & Laughlin Steel Corp., Pittsburgh, Pa.

Manufacture alkali metal salts of naphthalene-l-sulfonic acid. No. 1,992,481. Armin Hasler, Richard Meyer, and Joseph Schafer, Basel, Switzerland, to J. R. Geigy S. A., Basel, Switzerland.

Production nitrogeneous products of the aliphatic series. No. 1,992,489. Karl Keller, Frankfort-am-Main-Fechenheim, Germany, to General Aniline Works, New York City.

Production amino-nitriles; reacting acrylic nitrile with an ammonia base. No. 1,992,615. Ulrich Hoffmann and Bernhard Jacobi, Ludwigshafen-am-Rhine, Germany, to I. G., Frankfort-am-Main, Germany.

Production lower aliphatic amines; passing a mixture of a vaporized lower aliphatic alcohol and ammonia over a catalyst composed of a rigid, porous gel impregnated with a dehydrating oxide. No. 1,992,935. Herrick R. Arnold, Elmhurst, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Thermal pretreatment of volatile coals for carbonizing and coking processes. No. 1,993,198. Clarence B. Wisner, Orange, N. J., to Coal Process Corp., Dover, Del.

Manufacture of phenols from alkali arylsulphonates. No. 1,992,167. Maurice Ernest Bouvier and Jean Jacques Chavan, Lyon & Louis Dominique Bardin, Venissieux, France, to Societe des Usines Chimiques, Rhone-Poulenc, Paris, France.

Manufacture monomethyl-para-aminophenol and its sulfate. No. 1,993,253. Chas. H. W. Whitaker, Marietta, O.; seventy-five one-hundredths to Industrial Dyestuff Co., East Providence, R. I.

Preparation phenyl mercaptans and intermediates. No. 1,993,663. Emeric Havas, So. Milwaukee, Wis., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Production a dibenzanthrone; fusing a benzanthrone with alcoholic potash in presence of an oxidizing agent. No. 1,993,667. Edw. T. Howell, Milwaukee, Wis., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Manufacture a dibenzanthrone; alkali-fusing a benzanthrone in presence of a nitrite. No. 1,993,668. Edw. T. Howell, Milwaukee, Wis., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Production chlor-sulfonated aromatic hydrocarbons. No. 1,993,722. Lucas P. Kyrides, St. Louis, Mo., to Monsanto Chemical Co., St. Louis, Mo.

Preparation an ester of an organic polycarboxylic acid, at least one acid hydrogen of which has been replaced by the lauryl radical. No. 1,993,736. Geo. De Witt Graves and Walter Eastby Lawson, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Preparation decyl esters of polycarboxylic acids. No. 1,993,737. Geo. De Witt Graves, Wilmington, Del., and Walter Eastby Lawson, Woodbury, N. J., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Preparation myristyl ester of polycarboxylic acids. No. 1,993,738. Geo. De Witt Graves, Wilmington, Del., and Walter Eastby Lawson, Woodbury, N J., to E. I. du Pont de Nemours & Co, Wilmington, Del.

Reaction product of a non-substituted hydrocarbon mercury compound and a salt of a higher fatty acid of a saponifiable fat. No. 1,993,776. Max Engelmann and Albert L. Flenner, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Reaction product of a phenyl mercury compound and a salt of a higher fatty acid of a saponifiable fat. No. 1,993,777. Max Engelmann and Albert L. Flenner, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Manufacture a ketene modified polyhydric alcohol-polybasic acid resin. No. 1,993,828 Merlin Martin Brubaker and Geo. De Witt Graves, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Apparatus for production of coke and recovery of by-products. No. 1,993,934. Zareh H. Kevorkian, Fairfield, Ala.
Production N-dihydro-1,2,2',1'-anthraquinone azine. No. 1,994,484. Ferdinard W. Peck, Penns Grove, N. J., and Francis Knowles, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Preparation high molecular anthraquinone derivatives. No. 1,994,622. Robert E. Schmidt and Curt Bamberger, Wuppertal-Elberfeld, Germany, to General Aniline Works, Inc., New York City.

Coatings

Production crinkled coated surfaces by application of a crinkle coating composition. No. 1,991,527. Karel Toll, Passaic, N. J., to Chadeloid Chemical Co., New York, N. Y.
Coating composition for producing crinkled surface coatings; using China wood oil as binder. No. 1,991,528. Karel Toll, Passaic, N. J., to Chadeloid Chemical Co., New York City.
Production a lacquer suitable for brush application; including a cellulose derivative, dissolved in a slowly volatile organic solvent, and a plasticity producing agent. No. 1,991,533. Wm. Courtney Wilson and Chas. Elliott Fawkes, Chicago, Ill., to Pyroxylin Products, Inc., Chicago, Ill.
Manufacture acoustic coating material; containing ground cork, a water soluble adhesive and cementitious material capable of setting with water. No 1,991,877. Anthony M. Zottoli, Quincy, Mass.
Potentially reactive coating composition adapted for coating or impregnating. No. 1,993,708. Jos. V. Meigs, Dobbs Ferry, N. Y., to Plastix Corp., Wilmington, Del.
Process for obtaining improved shellac compositions for plastic molding. No. 1,994,071. Wm. Howlett Gardner, New York City.
Process coating glass and other objects with a varnish film. No. 1,994,-269. Cyril Wilfred Bonniksen, Slough, England, to Protectoglass, Ltd., London, England.
Coating composition of hydraulic cement, hydrated lime, a soluble chloride, and an acetate. No. 1,994,438. Herman A. Scholz, Oak Park, and Osborne Haydon, Chicago, Ill., to U. S. Gypsum Co., Chicago, Ill.
Preparation closely adhering lacquer coating, decomposable by sunlight, and a light filtering overcoating comprising an organic derivative of cellulose and a compound from the group of xanthydrol and phthalanil. No. 1,994,596. Cyril J. Staud and Thos. F. Murray, Jr., Rochester, N. Y., to Eastman Kodak Co., Rochester, N. Y.

Dyestuffs

Production rhodamine dyes. No. 1,991,482. Otto Allemann, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Preparation disazo dye. No. 1,991,505. Henry Jordan, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Preparation vat dyestuff and intermediate of the pyrene-quinone and perylene-quinone series. No. 1,991,687. Ralph N. Lulek and Melvin A. Perkins, Milwaukee, Wis., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Production complex metal compounds of azo dyestuffs. No. 1,991,808. Hans Krzikalla and Walter Limbacher, Ludwigshafen-am-Rhine, Germany, to General Aniline Works, Inc., New York City.
Production water-insoluble azo dyestuffs, yielding generally red shades. No. 1,992,461. Max Baltes and Kurt Briesewitz, Leverkusen-I. G.-Werk, and Arthur Zitscher, Offenbach-am-Main, Germany, to General Aniline Works, New York City.
Production water-insoluble azo dyestuff. No. 1,992,917. Werner Kirst and Max Kerth, Frankfort-am-Main, Germany, to General Aniline Works, New York City.
Manufacture new green sulfur dyestuffs. No. 1,993,087. Ernest Chapman, Worsley, Manchester, and Wm. Bertram Waddington, Higher Crumpsall, Manchester, England, to Imperial Chemical Industries, Ltd., London, England.
Production dyestuffs of the anthraquinone series. No. 1,991,885. George Holland Ellis, Henry Chas. Olpin, and Ernest Wm. Kirk, Spondon, near Derby, England, to Celanese Corp. of America, a corporation of Delaware.
Conversion into a dye mordant of a photographic image carried by a gelatin coating, by treatment with reagents, one of which is an iodin salt. No. 1,992,169. Percy D. Brewster, Rumson, N. J.
Production an azo dye in the form of relatively hard shiny flakes. No. 1,992,185. Wm. Stansfield Calcott, Penns Grove, Francis Hervey Smith, Woodstown, and Geo. Barnhart, Woodbury, N. J., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Preparation zinc chloride double salts of diazo compounds. No. 1,993,-433. Gerald Bonhote, Basel, Switzerland, to Society of Chemical Industry in Basle, Basel, Switzerland.
Manufacture chromiferous azo dyestuffs. No. 1,993,462. Fritz Straub, Basel, and Hermann Schneider, Riehen, near Basel, Switzerland, to Society of Chemical Industry in Basle, Basel, Switzerland.
Indanthrone printing color; a sulfonation derivative of halogenated indanthrone. No. 1,993,660. Robt. J. Goodrich, So. Milwaukee, and Jos. Deinet, Milwaukee, Wis., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Production vat dyestuffs of the benzanthrone series. No. 1,994,025. Heinrich Neresheimer, Ludwigshafen-am-Rhine, Germany, to General Aniline Works, Inc., New York City.
Production vat dyestuff of the anthraquinone acridone series. No. 1,994,033. Robert Berliner, Leverkusen, near Cologne-on-the-Rhine, Germany, to General Aniline Works, Inc., New York City.
Manufacture metalliferous dyestuffs. No. 1,994,116. Fritz Straub and Hans Mayer, Basel, Switzerland, to Society of Chemical Industry in Basle, Basel, Switzerland.
Manufacture vat dyestuffs of the dibenzanthrone series. No. 1,994,136. Max Albert Kunz, Mannheim, and Karl Koeberle, Ludwigshafen-am-Rhine, Germany, to General Aniline Works, Inc., New York City.
Preparation neothiazolocarbocyanine dye. No. 1,994,562. Leslie G. S. Brooker, Rochester, N. Y., to Eastman Kodak Co., Rochester, N. Y.
Preparation thiazolocarbocyanine dye. No. 1,994,563. Leslie G. S. Brooker, Rochester, N. Y., to Eastman Kodak Co., Rochester, N. Y.
Preparation vat dyestuffs of the anthraquinone triazine series. No. 1,994,602. Franz Wieners, Opladen, Germany, to General Aniline Works, Inc., New York City.
Production dyestuff salt containing heavy metals in complex combination in the acid component. No. 1,994,709. Karl Holzach and Fritz Lange, Ludwigshafen-am-Rhine, Germany, to General Aniline Works, Inc., New York City.

Explosives, etc.

Preparation priming composition containing a basic lead salt of 2-4 di-nitro benzoic acid, a suitable combustion initiator, and a suitable oxidizer. No. 1,991,730. Willi Brun, Bridgeport, Conn., to Remington Arms Co., Inc., Bridgeport, Conn.
Preparation priming mixture containing basic lead nitrate and a combustion initiator. No. 1,991,731. James E. Burns, Bridgeport, Conn., to Remington Arms Co., Inc., Bridgeport, Conn.
Production a low density gelatin dynamite; comprising a gelatinized liquid explosive and a vegetable pith. No. 1,992,189. Fred. F. Chapman, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Manufacture blasting explosive, containing ammonium nitrate as principal ingredient and at least one sensitizing agent. No. 1,992,217. Wm. Earle Kirst, Woodbury, N. J., and Clifford A. Woodbury, Media, Pa., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Preparation dynamite composition characterized by low density; comprising a liquid explosive ingredient and disintegrated sunflower stalks. No. 1,992,224. Harold A. Lewis, Woodbury, N. J., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Fine Chemicals

Manufacture of aromatic selenium compounds. No. 1,991,646. Alex. J. Wuertz, Carrollville, Donald P. Graham, So. Milwaukee, and Melvin A. Perkins, Milwaukee, Wis., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Production bismuth salts of organic carboxylic acids. No. 1,991,783. Max Bockmuhl and Walther Persch, Frankfort-am-Main, Germany, to Winthrop Chemical Co., Inc., New York, N. Y.
Bactericidal preparations, including water and a hydroxy diphenyl and an alkali salt thereof. No. 1,992,577. Eugene Moness, Far Rockaway, N. Y., to E. R. Squibb & Sons, New York City.
Production glutamic acid compounds. No. 1,992,804. Edw. Bartow and Raymond L. Albrook, Iowa City, Iowa, to A. E. Staley Mfg. Co., Decatur, Ill.
Preparation an organic acid ester of cellulose, in which cellulose is esterified with an organic acid anhydride in presence of a catalyst. No. 1,992,958. Carl J. Malm and Chas. L. Fletcher, Rochester, N. Y., to Eastman Kodak Co., Rochester, N. Y.
Preservation actinically sensitive chromated colloid films; treating freshly dried film with a coating of water insoluble but water permeable waxy material and drying. No. 1,992,965. Geo. S. Rowell, Cleveland, O., to Multigraph Co., Wilmington, Del.
Aliphatic amine salts of halogenated pyridones containing an acid group. No. 1,993,039. Joachim Reitmann, Wuppertal-Vohwinkel, Germany, to Winthrop Chemical Co., New York City
Production tertiary amines and products thereof. No. 1,993,542. Saul Caspe, Brooklyn, N. Y.
Preparation esters of polybasic acids. No. 1,993,552. Emmette F. Izard, Elsmere, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Preparation metal salts of acetylsalicylic acid free from salicylic acid and acetylsalicylic acid. No. 1,993,743. Clemmy O. Miller, Chicago, Ill.
Preparation hydroxyalkylcellulose ester. No. 1,994,038. Max Hagedorn, Dessau-in-Anhalt, and Paul Moller, Dessau-Ziebigk in Anhalt, Germany, to I. G., Frankfort-am-Main, Germany.
Preparation compound of the distyryl pyridinium salt series. No. 1,994,170. Martin Dabelow and Alfred Philips, Frankfort-am-Main, Germany, to Agfa Ansco Corp., Binghamton, N. Y.
Manufacture sodium aurothiomalate having formula $C_4H_8O_4SAuNa_2H_2O$. No. 1,994,213. Marcel Delepine, Paris, France to Societe des Usines Chimiques Rhone-Poulenc, Paris, France.
Production colloidal-base films which can be rendered light-sensitive by treatment with a solution of a bichromate. No. 1,994,289. Frank Wm. Sharp, London, England, to The Autotype Co., Ltd., London, England.
Recovery iodine; treatment silver iodide with chlorine. No. 1,994,416. Chas. W. Girvin, Long Beach, Cal., to Io-Dow Chemical Co., Long Beach, Cal.
Preparation of an organic acid ester of cellulose; hydrolyzing the cellulose ester in a bath containing sulfur dioxide. No. 1,994,599. Chas. S. Webber and Cyril J. Staud, Rochester, N. Y., to Eastman Kodak Co., Rochester, N. Y.
Manufacture cellulose naphthenate laurate. No. 1,994,608. Max Hagedorn, Dessau in Anhalt, Germany, to I. G., Frankfort-am-Main, Germany.
Production thioglycollic acid; reducing 2:4-dinitrophenylthioglycollic acid with an alkaline solution. No. 1,994,641. Norman Hulton Haddock and Frank Lodge, Blackley, Manchester, England, to Imperial Chemical Industries, Ltd., London, England.
Method refining fruit juices, i.e. pineapple; by treatment with an alkaline compound of an alkali earth metal. No. 1,994,670. Ashton T. Scott, Radnor, Pa., to Sharples Specialty Co., Phila., Pa.
Alkylation of aromatic amines. No. 1,994,851. Paul Whittier Carleton, Penns Grove, and Jos. Donald Woodward, Salem, N. J., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Process of N-alkylating aromatic amines of the benzene and naphthalene series. No. 1,994,852. Paul Whittier Carleton, Penns Grove, N. J., and Joseph Donald Woodward, Salem, N. J., to E. I. du Pont de Nemours & Co., Wilmington, Del.
Method stabilizing a hydrogen peroxide solution, by adding thereto a paradihydroxy benzene compound. No. 1,995,063. Chas. Roberts Harris and John Louis Fahs, Niagara Falls, N. Y., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Industrial Chemicals, Apparatus Equipment

Preparation a catalytic mass containing a catalytically active substance in the form of at least two different compounds. No. 1,991,448. Gerald C. Connolly and Jeremiah A. Pierce, Balto., Md., to Chester F. Hockley, receiver for The Silica Gel Corp., Balto, Md.
Production concentrated nitric acid by the oxidation of ammonia. No. 1,991,452. Giacomo Fauser, Novara, Italy, to Montecatini, Societa Generale per l'Industria Mineraria Ed Agricola, Milan, Italy.

Method refrigeration; evaporating liquid amo and adsorbing the gaseous amo in a solid, porous adsorbent material. No. 1,991,465. Ernest B. Miller and Gerald C. Connolly, Balto., Md., to Chester F. Hockley, receiver for The Silica Gel Corp., Balto., Md.

Apparatus for producing dry gas from liquid. No. 1,991,568. Martin R. Murray, Kansas City, Mo.

Process halogenating a saturated organic compound. No. 1,991,600. Richard M. Deanesly, Berkeley, Cal., to Shell Development Co., San Francisco, Cal.

Manufacture preserved and dried yeast; comprising yeast mixed with aerated calcium sulphate cream. No. 1,991,629. Henry Riley, Kearny, N. J.; Edith Riley, administratrix of said Henry Riley, deceased.

Application mud-laden fluid for oil or gas wells; comprising a suspensible base and an added concentrated colloidal suspending agent. No. 1,991,637. Phillip E. Harth, St. Louis, Mo. to National Pigments & Chemical Co., St. Louis, Mo.

Preparation a dry color material having soft grinding properties; using sulfuric acid and an aqueous alkaline carbonate solution during process. No. 1,991,647. Wm. A. Adamson, So. Milwaukee, Wis., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Plastic molding apparatus, having a turntable conveyor including three superposed annular frames. No. 1,991,706. Ralph L. Seabury, Anderson, Ind., to General Motors Corp., Detroit, Mich.

Production formic acid from a gaseous mixture containing CO and steam; passing gaseous mixture over a zinc chloride catalyst in the presence of hydrogen chloride. No. 1,991,732. Gilbert B. Carpenter, Bellemoor, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Preparation alkyl aryl ketones; using an aliphatic carboxylic acid anhydride, an aromatic compound, and a Friedel and Crafts condensing agent. No. 1,991,743. Philip H. Groggins, Washington, D. C., to Secretary of Agriculture of the U. S.

Process for concentrating sulfuric and sludge acids. No. 1,991,745. Ingenuin Hechenbleikner, Charlotte, N. C., to Chemical Construction Corp., a Corporation of Delaware.

Production aldehyde-hydrogen sulfide reaction agent; reacting hydrogen sulfide and an aldehyde in an aqueous solution. No. 1,991,765. Barnard M. Marks, Arlington, N. J., to du Pont Viscoloid Co., Wilmington, Del.

Method impregnating wood containing moisture; using non-aqueous solution. No. 1,991,811. Frank H. Lyons, Memphis, Tenn., to E. L. Bruce Co., Memphis, Tenn.

Process acid treating clay to render it chemically active as a filtering and decolorizing agent for oils, syrups, and the like. No. 1,991,819. Perley G. Nutting, Washington, D. C., to M. Jeannette Kaylor, Hagerstown, Md.

Reclaiming fiber from waste paper; subjecting a dilute suspension of the waste paper to the action of a deinking composition, comprising alkali metal, sulfurous acid, and soap-forming fatty acid radicles. No. 1,991,823. Francis H. Snyder, Niagara Falls, N. Y., to Snyder-Maclaren Processes, Inc., New York City.

Production thiourea. No. 1,991,852. Ralph V. Heuser, Cranford, N. J., to American Cyanamid Co., New York, N. Y.

Manufacture alkali metal carbonates and hydroxides, and recovery of ammonium chloride. No. 1,992,318. Robt. B. MacMullin, Niagara Falls, N. Y., to Mathieson Alkali Works, Inc., New York, N. Y.

Manufacture potassium carbonate and sodium sulfate. No. 1,992,324. Friedrich Rusberg, Berlin-Niederschoneweide, Germany, to Kali-Chemie Aktiengesellschaft, Berlin, Germany.

Process making red lead from a finely divided powdered material, composed of metallic lead and an oxide of lead lower than red lead. No. 1,992,395. Clarence C. Rose and Richard E. Sears, Cleveland, O., to Willard Storage Battery Co., Cleveland, O.

Process for accelerating thorough hardening of shaped casein articles; by saturation with ammonium chloride formaldehyde, and final use of heat. No. 1,992,478. Henry Dumont, Hamburg, Germany, to Internationel Galalith-Gesellschaft Hoff & Co., Harburg-Wilhelmsburg (Elbe), Germany.

Production higher alcohols, particularly butyl, from ethyl alcohol. No. 1,992,480. Otto Fuchs, Constance, Germany, and Wilhelm Querfurth, Kreuzlingen, Switzerland, to Deutsche Gold-und Silber-Scheideanstalt vormals Roessler, Frankfort-am-Main, Germany.

Apparatus for and method of obtaining carbon dioxide. No. 1,992,486. Franklin B. Hunt, Chicago, Ill., to Liquid Carbonic Corp., Chicago, Ill.

Method removing dissolved silica from natural alkaline brines. No. 1,992,532. Walter A. Kuhnert, Pasadena, Cal.

Production secondary and tertiary alkyl thiocyanates. No. 1,992,533. Wm. M. Lee, Bala-Cynwyd, Pa.

Production an acid-digested and calcined diatomaceous earth filter aid. No. 1,992,547. Clyde C. Schuetz, Somerville, N. J., to Johns-Manville, Corp., New York City.

Fixation of atmospheric nitrogen by means of an electric arc. No. 1,992,566. Emile Briner, Geneva, and Chas. Henri Wakker, Conches, Geneva, Switzerland.

Production a heat-convertible synthetic resin which when cooked with varnish oil forms insoluble complexes. No. 1,992,570. Henry A. Gardner, Washington, D. C.

Production sulfates and sulfur by intramolecular transformation. No. 1,992,572. Chas. Harnist, Paris, France.

Production acetylene from a gas, comprising a dispersed combustible carbonaceous substance in combination with hydrogen. No. 1,992,598. Paul Baumann and Heinrich Schilling, Ludwigshafen-am-Rhine, and Robt. Stadtler, Ziegelhausen, Germany, to I. G., Frankfort-am-Main, Germany.

Treatment sulfur; heating a mixture of sulfur, water, and a protective colloid to form a mixture which includes melted sulfur of low viscosity. No. 1,992,611. Geo. E. Grindrod, Oconomowoc, Wis., to Grindrod Process Corp., Waukesha, Wis.

Production nitroso compound of cobalt; acting with a gas comprising nitrogen monoxide on a metallic cobalt material. No. 1,992,637. Leo Schlecht and Fritz Spaun, Ludwigshafen-am-Rhine, Guenther Hamprecht, Oppau, Germany, to I. G., Frankfort-am-Main, Germany.

Method of forming a molded powder. No. 1,992,638. Carleton N. Smith, Lakewood, Ohio, to National Carbon Co., a corporation of New York.

Production of sulfates by the mutual reaction of sulfur dioxide oxygen, and bases in an aqueous medium. No. 1,992,681. Conway, Baron von Girsewald and Erich Stahl, Frankfort-am-Main, Germany, to American Lurgi Corp., New York City.

Production coarsely crystalline iron oxide from ferric chloride. No. 1,992,685. Ernest W. Wescott, Niagara Falls, N. Y., to Sulphur & Smelting Corp., Dover, Del.

Process oxidizing cracked petroleum. No. 1,992,691. Carleton Ellis, Montclair, N. J., to Ellis-Foster Co., Montclair, N. J.

Production bronzing paint of the leafing type; using uintahite, a varnish, a drying oil, a volatile thinner, and a powdered metallic bronzing pigment. No. 1,992,695. Thos. C. Ford, Kankakee, Ill., to American Asphalt Paint Co., a corporation of Illinois.

An adhesive asphaltic tar composition having a high degree of ductility combined with quick-setting properties. No. 1,992,752. Wm. H. Kershaw, Forest Hills, N. Y., to Texas Co., New York City.

Manufacture carbon bisulfide; impregnating a carbon with a catalyst which promotes the union of sulfur and carbon. No. 1,992,832. Frank J. Mootz, Indianapolis, Ind., to Peter C. Reilly, Indianapolis, Ind.

Obtaining solutions of beryllium fluoride from double fluoride of beryllium and of an alkali metal. No. 1,992,854. Maurice Beja, Salindres, France, to Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges et Camargue, Paris, France.

Production glue from cotton and wood pulp, by digestion in an alkaline solution. No. 1,992,867. Otis Johnson, Tacoma, Wash.

Production butyl alcohol and acetone by fermentation. No. 1,992,921. James F. Loughlin, Milwaukee, Wis.

Soluble polysulfide and organic compound reaction product and process. No. 19,487. Reissue. Jos. C. Patrick, Trenton, N. J.

Apparatus and method of preparing dispersions of two or more substances. No. 1,992,938. Leslie A. Chambers, Phila., Pa., and Newton Gaines, Ft. Worth, Tex., to Wm. H. Ashton, Phila., Pa.

Suspension agent for use in a flotation process comprising floating soap, obtained as a floating scum from black liquors in the manufacture of sulfate or soda cellulosic material. No. 1,992,949. Paul Hodges, Tuscaloosa, Ala., to Gulf States Paper Corp., a corporation of Delaware.

Chemical apparatus; a pressure filling burette. No. 1,993,001. Wm. O. Geyer, Bloomfield, N. J.

Resulting product from the reaction of maleic anhydride and an alphaterpinene. No. 1,993,025. Ernest G. Peterson, Kenvil, and Edwin R. Littmann, Haddonfield, N. J., to Hercules Powder Co., Wilmington, Del.

Resulting product from reaction of terpinene-maleic anhydride and alcohol. No. 1,993,026. Edward R. Littmann, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Resulting product from the reaction of a polyhydric alcohol and terpinene-maleic anhydride. No. 1,993,027. Ernest G. Peterson, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Production a synthetic resin; the reaction of a polyhydric alcohol, terpinene-maleic anhydride, and a fatty acid. No. 1,993,028. Ernest G. Peterson, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Production a synthetic resin; reaction of an alcohol and an acidic composition. No. 1,993,029. Ernest G. Peterson, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Manufacture a synthetic resin; by combining a polyhydric alcohol, an organic carboxylic acid, and a reaction product. No. 1,993,030. Ernest G. Peterson, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Resulting product from the reaction of a terpene hydrocarbon of the formula $C_{10}H_{16}$. No. 1,993,031. Ernest G. Peterson, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Resulting product from the reaction of an acidic resin formed from a terpene hydrocarbon of the formula $C_{10}H_{16}$. No. 1,993,032. Ernest G. Peterson, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Resulting product from the reaction of a polyhydric alcohol and an acidic resin formed from a terpene hydrocarbon of the formula $C_{10}H_{16}$. No. 1,993,033. Ernest G. Peterson, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Synthetic resin; product of the reaction of a pinene and maleic anhydride. No. 1,993,034. Irvin W. Humphrey, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Production a pinene-maleic anhydride reaction product. No. 1,993,035. Edwin R. Littmann, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Synthetic resin, from the reaction of a pinene, maleic anhydride, and a compound containing the abietyl radical. No. 1,993,036. Irvin W. Humphrey, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Reaction product of cineol and maleic anhydride, and process of making it. No. 1,993,037. Edwin R. Littmann, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Production lower alkyl esters of alpha alkyl-substituted acrylic esters. No. 1,993,089. John Wm. Croom Crawford, Ardrossan, Scotland, to Imperial Chemical Industries, Ltd., London, England.

Metal cleaning and corrosion inhibiting composition, of "floating soap" obtained from black liquors in the manufacture of soda or sulfate cellulosic material, an organic metal cleaning solvent, and water. No. 1,993,097. Paul Hodges, Tuscaloosa, Ala., to Gulf States Paper Corp., a corporation of Delaware.

A degreasing agent; using two organic grease solvents, one of chlorinated hydrocarbon, the other alcohol; and the remainder "floating soap" obtained from black liquors in the manufacture of soda or sulfate cellulosic material. No. 1,993,098. Paul Hodges, Tuscaloosa, Ala., to Gulf States Paper Corp., a corporation of Delaware.

Process for treating substantially dry fats or fatty acids to retard oxidation and the consequent undesirable changes. No. 1,993,152. Eddy W. Eckey, Wyoming, Ohio, to Procter & Gamble Co, Cincinnati, O.

Process stabilizing against rancidity, due to oxidation, unsaturated fatty materials which are substantially dry and free from organic matter subject to bacterial decomposition. No. 1,993,181. Albert S. Richardson, Wyoming, Ohio, Frank C. Vibrans, Chicago, Ill., and John T. R. Andrews, Cincinnati, O., to Procter & Gamble Co., Cincinnati, O.

Production vitreous enameled articles having a gloss and matt finish; using a zinc compound in process. No. 1,993,196. Richard Turk, Balto., Md., to Porcelain Enamel & Mfg. Co. of Balto., Balto., Md.

Coal coloring composition adapted to withstand weathering and the action of cold water; using hide glue and water insoluble coloring matter, plasticizing wax, and formaldehyde as preserving agent. No. 1,991,872. Foster Dee Snell, Brooklyn, N. Y., and Alfred H. P. O'Connor, New York City; said O'Connor assignor to said Snell.

Apparatus and method for oxidizing phosphorus. No. 1,991,916. Robert E. Zinn, Chicago Heights, Ill., to Victor Chemical Works, Chicago, Ill.

Method controlling the accumulation of aldehydes in the formation of organic acids from primary alcohols. No. 19,478. Reissue. Wm. J. Hale, Washington, D. C., and Wm. S. Haldeman, Monmouth, Ill.

Production condensation products; reacting zinc chloride, urea, and formaldehyde in an aqueous solution. No. 1,992,180. Albert Henry Bowen and Theo. Williams Dike, Seattle, Wash., to I. F. Laucks, Inc., Seattle, Wash.

Manufacture lead carbonate from lead chloride. No. 1,992,191. Niels C. Christensen, Salt Lake City, Utah.

Method aerating slurry. No. 1,992,208. Arthur Hugo Harrison, Gold Pines, Ont., Canada.

Production laminated material which does not appreciably buckle, curl or wrinkle, and has the property of normally lying flat. No. 1,992,249. Jas. E. Snyder, Kenmore, N. Y., to Du Pont Cellophane Co., Inc., New York City.

Production of calcium cyanamide from calcium carbonate, carbon monoxide, and synthetic ammonia No. 1,992,289. Nikodem Caro, Berlin-

Dahlem, Albert Rudolph Frank, Berlin-Halensee, and Hans Heinrich Franck, Berlin-Charlottenburg, Germany.

Improved process preserving beta-alkoxy ethanols. No. 1,992,292. Henry L. Cox, So. Charleston, and Paul S. Greer, Charleston, W. Va., to Carbide & Carbon Chemicals Corp., New York City.

Method producing SO_2. No. 1,992,295. Frederik W. de Jahn and Jacob D. Jenssen.

Removal formic acid from its mixture with other fatty acids. No. 1,993,259. Hyym E. Buc, Roselle, N. J., to Standard Oil Development Co., Bayways, N. J.

Preparation alcohol denaturant; solution containing chiefly ethyl alcohol and a liquid containing combined sulfur and directly linked to oxygen. No. 1,993,270. Per K. Frolich and Floyd Laverne Miller, Elizabeth, N. J., to Standard Oil Development Co., Bayways, N. J.

Improved denaturant for alcohol. No. 1,993,271. Per K. Frolich and Floyd Laverne Miller, Elizabeth, N. J., to Standard Oil Development Co., Bayways, N. J.

Conversion of mercaptan to thio-ether. No. 1,993,287. Wm. Seaman, Glens Falls, N. Y., to Standard Oil Development Co., Bayways, N. J.

Production a core of plastic material containing a composition of coal and an oil solvent. No. 1,993,343. Earl V. Harlow, East Orange, N. J., to Koppers Co. of Delaware, Pittsburgh, Pa.

Process of revivifying absorbents. No. 1,993,345. Chas. L. Jones, Pelham, N. Y., to Adico Development Corp.

Production and purification of products reacted with sulfonating agents. No. 1,993,375. Martin Luther, Mannheim, and Adolf v. Friedolsheim, Ludwigshafen-am-Rhine, Germany, to I. G., Frankfort-am-Main, Germany.

Process dewaxing mineral oils. No. 1,993,396. Harry T. Bennett, Tulsa, Okla., to Mid-Continent Petroleum Corp., Tulsa, Okla.

Preparation a sulfonated polymerized terpene product. No. 1,993,415. Alfred L. Rummelsburg and Bunyan H. Little, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Preparation a solid organic salt of a sulfate of an aliphatic alcohol, having more than 9 carbon atoms in the molecule. No. 1,993,431. Heinrich Bertsch, Chemnitz, Germany, to H. Th. Bohme Aktiengesellschaft, Chemnitz, Germany.

Impregnating carbonaceous material with ammonium nitrate. No. 1,993,434. Hubert H. Champney, Kenvil, N. J., to Hercules Powder Co., Wilmington, Del.

Production artificial fuel; solidifying a nitrocellulose solution by placing a solid body of water moist soap therein. No. 1,993,517. Herbert Kranich, West Hempstead, N. Y.

Production aliphatic carboxylic acids; reacting a halogenated aliphatic hydrocarbon and steam with carbon monoxide. No. 1,993,555. Alfred T. Larson, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Separation of diolefines from hydrocarbon mixtures. No. 1,993,681. Granville A. Perkins, So. Charleston, W. Va., to Carbide & Carbon Chemicals Corp., New York City.

Production a non-volatile plastic fusible resinous condensation product. No. 1,993,700. Lloyd C. Swallen and Kenneth M. Irey, Terre Haute, Ind., to Commercial Solvents Corp., Terre Haute, Ind.

Production emulsion of oil-in-water type; disperse phase being a solution of copper oleate in butyl alcohol; aqueous phase having dissolved therein a salting out agent, which is chemically inactive toward butyl alcohol. No. 1,993,706. Herbert Langwell, Epsom, England, to Distillers Co., Ltd., Edinburgh, Scotland.

Chlorinating propionic acid in presence of a carboxylic acid halide. No. 1,993,713. Shailer L. Bass and Wayne L. Burlew, Midland, Mich., to Dow Chemical Co., Midland, Mich.

Conversion isobutyl chloride to tertiary-butyl chloride. No. 1,993,719. Howard S. Nutting, Edgar C. Britton, Myron E. Huscher, and Peter S. Petrie, Midland, Mich., to Dow Chemical Co., Midland, Mich.

Apparatus for plastic molding. No. 19,496. Reissue. Wilfrid G. Lawson, Akron, O., to B. F. Goodrich Co., New York City.

Natural gas conversion process. No. 19,500. Reissue. Malcolm P. Youker, Bartlesville, Okla.

A composition of matter in which carbonate filler is present, comprising flocculation product of the interaction of carbonate filler, paraffin emulsion, and water soluble aluminum compound. No. 1,993,750. Harold Robert Rafton, Andover, Mass., to Raffold Process Corp., a corporation of Mass.

Carbonizing mass of solid carbonizable material in a closed retort in presence of a catalyst operating to alter tarry acids to neutral compounds. No. 1,993,756. Harold Stevens, Cincinnati, to Harold Stevens, trustee.

Composition for purification of watery materials, being a mixture of dry activated carbon and a dry coagulant. No. 1,993,761. Benjamin F. Tippins, Yulee, Fla., to Activated Alum Corp., New York City.

Colloid Mill. No. 1,993,762. Chas. P. Tolman, Kew Gardens, N. Y., to Noble & Wood Machine Co., Hoosick Falls, N. Y.

Preserving agents for animal and vegetable fats, fatty oils, and soap; using di-p:p'-hydroxy-diphenyl as an oxidation inhibitor. No. 1,993,771. Wm. S. Calcott and Wm. A. Douglass, Pennsgrove, N. J., and Herbert W. Walker, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Corrosion inhibitor for cooling systems using water in absence of electrolytes. No. 1,993,773. Richard G. Clarkson, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Accelerator compound; a dark high-boiling, viscous liquid or resinous solid obtained by chemical combination. No. 1,993,803. Donald H. Powers, Pennsgrove, N. J., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Manufacture abrasive article comprising abrasive grains and a bond of metastyrol and a plasticizer. No. 1,993,821. Raymond C. Benner, Niagara Falls, N. Y., and Garnett H. Porter, Pittsfield, Mass., to Carborundum Co., Niagara Falls, N. Y.

Method for carrying out of molecular associations and transformations. No. 1,993,886. Alphons O. Jaeger, Crafton, and Kurt F. Pietzsch, Pittsburgh, Pa., to American Cyanamid & Chemical Corp., New York City.

Apparatus and method for molding thermoplastic material. No. 1,993,942. Emil E. Novotny, Phila., Pa., to John Stogdell Stokes, Huntingdon Valley, Pa.

Defoaming apparatus. No. 1,993,944. David D. Peebles, Eureka, Cal.

Production permeable ceramic article; using magnesia, alumina and silica. No. 1,993,955. Raymond C. Benner and Henry N. Baumann, Jr., Niagara Falls, N. Y., to Carborundum Co., Niagara Falls, N. Y.

Preparation quinone-oxime pigment; reacting upon a solution of the bisulfite compound of nitrosobetanaphthol with a compound of iron and one of zinc. No. 1,993,971. Donald E. MacQueen, Hillside, N. J., to Krebs Pigment & Color Corp., Newark, N. J.

Apparatus for handling powdered, pulverized, or crushed sulfur and other low heat conducting materials. No. 1,993,973. Claude P. McNeil, Whiting, Ind., to Standard Oil Co., Chicago, Ill.

Production zinc 2.4.5-trichlorophenolate. No. 1,994,002. Lindley E. Mills, Midland, Mich., to Dow Chemical Co., Midland, Mich.

Production halogenated derivatives of aliphatic hydrocarbons. No. 1,994,035. Carlton W. Croco, Woodstown, N. J., to Kinetic Chemicals, Inc., Wilmington, Del.

Manufacture protein products, by retarding the coagulating action of formaldehyde on protein, using ammonia also during process. No. 1,994,050. Teikichi Satow, Tokyo, Japan.

Process for treating raw phosphate for production valuable products. No. 1,994,070. Antonius Foss, Oslo, Norway, to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Oslo, Norway.

Composition for impregnation wood and other cellulosic materials; comprising a water solution of a metal salt, a fluoride, an ammonium salt, and a material to retard precipitation of insoluble metal salts. No. 1,994,073. Ernest F. Hartman, Kenilworth, N. J., and Willet F. Whitmore, Amityville, N. Y., to Protexol Corp., Kenilworth, N. J.

Production cineol; treating pine oil, having terpineol therein, with a mineral acid. No. 1,994,131. Clarence E. Greider, Cleveland, O., to Hercules Powder Co., Wilmington, Del.

Method of producing a patterned thermoplastic body. No. 1,994,164. Albert Tanner Bailey, Montclair, N. J., to Du Pont Viscoloid Co., Wilmington, Del.

Apparatus and method for trimming molded articles. No. 1,994,178. Paul A. Raiche, Providence, R. I., to Davol Rubber Co., a corporation of R. I.

Method improving whiteness of alkaline earth metal carbonates containing iron compounds. No. 1,994,271. John W. Church and Raymond R. McClure, Painesville, O., to Pure Calcium Products Co., Painesville, O.

Apparatus for evaporating liquids. No. 1,994,331. Manuel S. Ziskin and Victor D. Zeve, Cleveland, O., to V. D. Zeve, Inc., Cleveland, O.

Production hydraulic cement; selecting a clinker formed by firing a mixture of a calcareous magnesium carbonate material, silica, and a metal oxide fluxing agent. No. 1,994,377. Clyde E. Williams and John D. Sullivan, Columbus, O., to Battelle Memorial Institute, Columbus, O.

Production an iron-bearing briquette. No. 1,994,378. Clyde E. Williams and John D. Sullivan, Columbus, O., to Battelle Memorial Institute, Columbus, O.

Production an iron-bearing briquette. No. 1,994,379. Clyde E. Williams and John D. Sullivan, Columbus, O., to Battelle Memorial Institute, Columbus, O.

Preparation a lower fatty acid salt; reacting an ethylate with carbon monoxide in presence of an ether. No. 1,994,433. Edgar T. Olson, New York City, and Arthur W. Goos, Marquette, Mich., to Cleveland-Cliffs Iron Co., Cleveland, O.

Preparation salt resulting from reaction of an amino alcohol in which the hydroxylated radical is a normal open-chain radical. No. 1,994,467. Robert B. Flint and Paul L. Salzberg, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Removal wax from oil-wax mixtures adapted to be sweated. No. 1,994,485. Ivan M. Perkins, Brookline, Pa., and Floyd B. Hobart, Grandview Heights, O., to Atlantic Refining Co., Phila., Pa.

Preparation fire resistant binder finish composition consisting of magnesium chloride, magnesite, and asbestos. No. 1,994,492. Laura W. Van Dyke, Los Angeles, Cal.

Mercury boiler drum. No. 1,994,521. Howard J. Kerr, Westfield, John Prentice, Bayonne, and Geo. D. Ebbets, Kenilworth, N. J., to Babcock & Wilcox Co., Bayonne, N. J.

Recovery triphenyl phosphate from a mixture of nitro-cellulose and triphenyl phosphate. No. 1,994,591. Marvin Jerome Reid, Rochester, N. Y., to Eastman Kodak Co., Rochester, N. Y.

Manufacture a thermoplastic phonograph record having a surface coated with sputtered palladium. No. 1,994,668. Alex. G. Russell, Red Bank, N. J., to Bell Telephone Labs., New York City.

Imparting polished surfaces to wood by application of preformed thin foils of a thermoplastic material. No. 1,994,697. Arthur Eichengrun, Charlottenburg, Germany, to Celanese Corp. of America, a corporation of Delaware.

Production synthetic resins of the phenol-formaldehyde type. No. 1,994,714. Alfred Johnson, West New Brighton, N. Y., and Charles E. Howson, Elizabeth, N. J., to Combustion Utilities Corp., New York City.

Production a potentially reactive condensation product; reacting phenol with formaldehyde in presence of a condensing agent. No. 1,994,753. Oscar A. Cherry, Chicago, Ill., to Economy Fuse & Mfg. Co., Chicago, Ill.

Testing fluid for use in testing leakages in wells; including an acid electrolyte, bentonite clay, and barium sulfate. No. 1,994,761. Geo. H. Ennis, Long Beach, Cal., one-half to Robert V. Funk, Long Beach, Cal.

Preparation impregnating bath comprising mixture of chlorodiphenyls; method fire-proofing sulfur using chlorinated diphenyl. No. 1,994,810. Marc Darrin, Pittsburgh, Pa., to F. N. Burt Co., Ltd., Toronto, Ont., Canada.

Process treating chlorobenzene with aqueous ammonia in presence of potassium chlorate and ammonium nitrate. No. 1,994,845. Alex. John Wuertz, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Conversion sodium sesquicarbonate to sodium carbonate monohydrate. No. 1,994,892. Robert B. MacMullin and Geo. Lewis Cunningham, Niagara Falls, N. Y., to Mathieson Alkali Works, Inc., New York City.

Preparation sulfuric acid derivatives of the reaction products of a monohydric alcohol and a nuclear hydroxy substituted diphenyl and their alkali metal and alkaline earth salts. No. 1,994,927. Robert L. Sibley, Nitro, W. Va., to Rubber Service Labs. Co., Akron, O.

Manufacture flexible insulating material; using plastic composition of a cellulose ether and a plasticizer. No. 1,994,931. David Traill, Saltcoats, Scotland, to Imperial Chemical Industries, Ltd., London, England.

Apparatus for vaporizing liquids, and the absorption of smoke, bad odors, etc. No. 1,994,932. Pierre Lucien Vidal, Versailles, France.

Improved process of manufacturing organic acids, by the interaction of carbon monoxide and a compound of the aliphatic alcohols and olefine hydrocarbons group, in presence of a catalyst. No. 1,994,955. Alfred T. Larson, Wilmington, Del., to E. I. du Pont de Nemours & Co., Wilmington, Del.

Production low boiling hydrocarbon distillates from hydrocarbon gas and unvaporized residuum obtained in the cracking of hydrocarbon oils. No. 1,994,982. Ralph C. Cook, Chicago, Ill., to Universal Oil Products Co., Chicago, Ill.

Burner for solidified fuels. No. 1,995,049. Edwin R. Zeitz, New Haven, Conn.

Manufacture artificial leather, comprising an intimate mixture of rubber and fiber. No. 1,995,179. Benjamin Holm, Clifton, N. J., to U. S. Rubber Co., New York City.

Manufacture of formates, by treating with hydrogen in presence of a catalyst, an aqueous solution of a bicarbonate of the group of alkali-

metals and ammonium. No. 1,995,211. Andre Leroux, Ramioul, Belgium, to Franco-Belge d'Ougree, Ougree, Belgium.
Catalyst for oxidizing carbon monoxide to carbon dioxide. No. 1,995,-274. James F. Eversole, Charleston, W. Va., to Carbide & Carbon Chemicals Corp., New York City.

Metals, Alloys

Production thermostatic metal comprising a plurality of layers. No. 1,991,438. Carl R. E. Wohrman, Attleboro, Mass., to General Plate Co., Attleboro, Mass.
Method electroplating; depositing a layer of white nickel, followed by a layer of bright nickel. No. 1,991,747. George B. Hogaboom, New Britain, Conn., to Hanson-Van Winkle-Munning Co., Matawan, N. J.
Apparatus and method for stripping ores. No. 1,991,763. Frank W. Locke, Portland, Ore., to Coast Mining Co., Portland, Ore.
Production sintered hard metal alloy for working tools; consisting of titanium, nickel, chromium, tungsten, and carbon. No. 1,992,372. Julius Holzberger, Dachau, near Munich, Germany, to Gebr. Bohler & Co., Aktiengesellschaft, Berlin, Germany.
Bonding together cast iron powder and other metal powders including zinc and copper; to cause a firm bond between the named particles. No. 1,992,548. Chas. R. Short, Dayton, Ohio, to General Motors Corp., Detroit, Mich.
Production iron and zinc alloy; being a finely divided cast gray iron powder alloyed with zinc. No. 1,992,549. Chas. R. Short and Roland P. Koehring, Dayton, Ohio, to General Motors Corp., Detroit, Mich.
Production a magnesium base alloy; composed of magnesium and antimony. No. 1,992,655. Edw. F. Fischer, Cleveland, O., to Magnesium Development Corp., a corporation of Delaware.
Production an alloy steel, which is abnormal or characterized by a condition of appreciable dispersion or divorcement of cementite; using carbon, manganese, molybdenum, and iron. No. 1,992,905. Child Harold Wills, Marysville, Mich.
Rust inhibiting composition; comprising "floating soap" obtained from black liquors in the manufacture of sulfate or soda cellulosic materials, in water. No. 1,993,099. Paul Hodges, Tuscaloosa, Ala., to Gulf States Paper Corp., a corporation of Delaware.
Step of depositing chromium electrolytically from a solution of chromic acid in presence of an amount of compounds of selenium or tellurium. No. 1,993,186. Wilfred W. Scott, Attilio A. Bissiri, and Wm. C. Gregory, Los Angeles, Cal., Harriet E. Scott, executrix of said Wilfred W. Scott, deceased.
Method retarding action of a molten bath containing cyanide of sodium for case hardening iron, by incorporating barium oxide in same. No. 1,993,204. Walter Beck, Frankfort-am-Main, and Klaus Bonath, Cronberg-in-Taunus, Germany, to Deutsche Gold & Silber Scheideanstalt, vormals Roessler, Frankfort-am-Main, Germany.
Production a sintered hard metallic alloy; consisting of vanadium carbide, niobium carbide, and iron. No. 1,991,912. Karl Schroter, Berlin-Lichtenberg, and Hans Wolff, Berlin, Germany, to Fried. Krupp Aktiengesellschaft, Essen-am-Ruhr, Germany.
Method removing surface impurities from a magnesium article. No. 1,992,204. John A. Gann and Wm. H. Gross, Midland, Mich., to Dow Chemical Co., Midland, Mich.
Method treating magnesium article. No. 1,992,205. John A. Gann and Wm. H. Gross, Midland, Mich., to Dow Chemical Co., Midland, Mich.
Preparation an aluminum solder, consisting of aluminum, tin, zinc, and silver. No. 1,993,490. Friedrich Strasser, Basel, Switzerland.
Production an alloy for electric light reflectors and screens; being aluminum, silver, and magnesium. No. 1,994,112. Wilhelm Sanzenbacher, Zurich, Switzerland.
Production a bimetallic article, comprising a ferrous base having a tightly adherent coating in direct contact with the base; coating being a binary zinc-sodium alloy. No. 1,994,275. Herbert W. Graham and Samuel L. Case, Pittsburgh, Pa., to Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Production a bimetallic body, comprising a ferrous base having directly applied thereto a binary alloy of tin and sodium. No. 1,994,276. Herbert W. Graham and Samuel L. Case, Pittsburgh, Pa, to Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Purifying zinc vapor; by scrubbing vapor with molten zinc. No. 1,994,345. Leon S. Holstein, Great Neck, N. Y., and Philip M. Ginder, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Apparatus for purifying zinc. No. 1,994,346. Leon S. Holstein, Great Neck, N. Y., and Philip M. Ginder, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Apparatus for purifying zinc vapor. No. 1,994,347. Philip M. Ginder, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Method purifying lead by redistillation. No. 1,994,348. Philip M. Ginder, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Purification zinc metal contaminated with a metal whose boiling temperature is lower than that of zinc. No. 1,994,349. Philip M. Ginder, Willis M. Peirce, and Robert K. Waring, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Apparatus for purifying zinc metal. No. 1,994,350. Philip M. Ginder, Willis M. Peirce, and Robert K. Waring, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Purifying zinc metal contaminated with lead and cadmium. No. 1,994,351. Philip M. Ginder, Willis M. Peirce, and Robert K. Waring, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Method for purifying zinc contaminated with lead and cadmium. No. 1,994,352. Philip M. Ginder, Willis M. Peirce, and Robert K. Waring, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Apparatus for purifying zinc contaminated with lead and cadmium. No. 1,994,353. Philip M. Ginder, Willis M. Peirce, and Robert K. Waring, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Apparatus and method for purifying zinc vapor contaminated with lead and cadmium. No 1,994,354. Philip M. Ginder, Palmerton, Pa., and Harold G. Hixon, Depue, Ill., to New Jersey Zinc Co., New York City.
Method volatilizing zinc metal. No. 1,994,355. Willis M. Peirce and Robert K. Waring, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Apparatus for volatilizing zinc metal. No. 1,994,356. Willis M. Peirce and Robert K. Waring, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Method producing purified zinc vapor substantially free from cadmium and lead. No. 1,994,357. Philip M. Ginder, Willis M. Peirce, and Robert K. Waring, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Separation metals having different boiling temperatures, and purifying one metal with respect to the other. No. 1,994,358. Leon S. Holstein, Great Neck, N. Y., and Philip M. Ginder, Palmerton, Pa., to New Jersey Zinc Co., New York City.
Treatment iron oxide ores and other materials containing iron in oxide form. No. 1,994,367. Wm. Somerville Millar, London, England; Henry Dering, executor of said Wm. Somerville Millar, deceased, to Sulphide Corp., New York City.
Process etching a zinc plate by treatment with a dilute nitric acid containing copper dissolved therein. No. 1,994,499. Ernest R. Boller, Cleveland Heights, O., to Grasselli Chemical Co., Cleveland, O.
Process etching a zinc plate by treatment with an etching bath composed of nitric acid, copper and tartaric acid. No. 1,994,500. Ernest R. Boller, Cleveland Heights, O., to Grasselli Chemical Co., Cleveland, O.
Solution for removing silver from backs of mirrors, comprising muriatic acid, tartaric acid, and water. No. 1,994,633. Samuel Smith Boyd, Louisville, Ky.
Production corrosion resistant irons and steels; using bath of ferrous metal to which has been added a chrome ore and a reducing agent. No. 1,994,679. Wm. Bell Arness, Balto., Md., to Alloy Research Corp., Balto., Md.
Corrosion-resisting product; using a container with a hydrocarbon and a corrosion-resistant material exposed to the hydrocarbon, comprising polymerized halogen substitution product of vinyl acetate. No. 1,994,911. James G. Ford, Forest Hills, Pa., to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Method rendering silver articles non-tarnishable; by immersion in a solution of a metallic chromate. No. 1,995,225. Ernest Raub, Schwabisch Gmund, Germany, to Karl Michaelis, Berlin, Germany.

Naval Stores

Process refining wood rosin. No. 1,992,754. Fred. W. Kressman, Laurel, Miss., to Continental Turpentine & Rosin Corp., Laurel, Miss.

Pulp and Paper

Production improved paper pulp from fibrous vegetable material; using finely divided zinc, sulfur dioxide, and finely divided alkaline earth metal carbonate. No. 1,991,824. Francis H. Snyder, Niagara Falls N. Y., to Snyder-Maclaren Processes, Inc., New York City.
Method removing bleachable printing ink pigments from paper pulp containing ligno-cellulosic constituents; using an alkalin hypochlorite and an alkali in process No. 1,992,977. Sidney D. Wells, Appleton, Wis., to Lewis L. Allsted, Appleton, Wis.
Manufacture paper, employing a rosin size and a calcium carbonate filler. No. 1,993,265. Colver P. Dyer, Winchester, Mass., to Merrimac Chemical Co., Inc., Everett, Mass.
Process of de-inking paper stock; subjecting suspension of stock to action of an alkali, pyridine, and pine oil. No. 1,993,362. Walter S. Crisp, Fulton, N. Y., to Wm. J. Weir, Syracuse, N. Y.
Apparatus for coating paper, etc., with lacquers. No. 1,993,772. John Jerome Case, Bound Brook, N. J., to John Waldron Corp., New Brunswick, N. J.

Rubber

Production rubber goods directly from latex. No. 1,993,233. Geo. W. Winchester, West Haven, Conn., to Heveatex Corp., Melrose, Mass.
Manufacture rubber; in which the di-substituted guanidine belongs to the class of symmetrical diphenylguanidine, symmetrical phenyl-o-tolylguanidine and di-o-tolyguanidine. No. 1,991,860. Evelyn Wm. Madge, Stockland Green, Birmingham England, to Dunlop Rubber Co., Ltd., London, England.
Process for cold vulcanization of rubber by means of gaseous hydrogen sulfide and sulphur dioxide. No. 1,993,435. Walter Court, Brondesbury, England.
Manufacture rubber goods from latex. No. 1,993,596. James B. Crockett, Malden, Mass., to Heveatex Corp., Melrose, Mass.
Preparation stabilized chlorinated rubbers. No. 1,993,913. Wilhelm Becker, Cologne-Mulheim, and Alfred Blomer, Imbach, near Opladen, Germany, to I. G., Frankfort-am-Main, Germany.
Method coating articles with an adherent layer of rubber. No. 1,994,-165. Carl L. Beal, Cuyahoga Falls, O., to American Anode, Inc., Akron, O.
Creaming of rubber latex; product containing up to .5 part of a water-soluble alkylated cellulose per hundred parts of latex solids. No. 1,994,-328. Ralph F. Tefft, Nutley, N. J., to U. S. Rubber Co., New York City.
Vulcanized product formed by reaction of caoutchouc, a vulcanizing agent, an activator, and the reaction product of acetaldol with aniline and still further reaction of this material with formaldehyde. No. 1,994,732. Lorin B. Sebrell, Cuyahoga Falls, O., to Wingfoot Corp., Wilmington, Del.

Textiles

Production silk-like luster; improving vegetable textile materials, by impregnation with a cellulose derivative. No. 1,991,809. Leon Lilienfeld, Vienna, Austria.
Preparing organic fibers by contacting with an aqueous dispersion of cathode-depositing colloidal rubber, causing spontaneous consociation of fibers and rubber. No. 1,992,589. Geo. R. Tucker, No. Andover, and Langley W. Isom, Belmont, Mass., to Dewey & Almy Chemical Co., No. Cambridge, Mass.
Production discharge effects on materials made of or containing cellulose esters. No. 1,991,886. George Holland Ellis, Spondon, near Derby, England, to Celanese Corp. of America, a corporation of Delaware.
Production artificial silk from viscose. No. 1,993,847. Theodoor Koch, Arnhem, Netherlands, to American Enka Corp., Enka, N. C.
Production crepe fabrics; subjecting yarns containing filaments of cellulose esters to surface saponification, final step being an aqueous treatment. No. 1,993,922. Henry Dreyfus, London, and Wm. Alex. Dickie and Chas. Wm. North, Spondon, near Derby, England, to Celanese Corp. of America, a corporation of Delaware.

Water Treatment

Sewage treating process. No. 1,991,896. Clyde C. Hays, Waco, Texas.
Apparatus and method for treating sewage and other liquids carrying finely divided combustible matter entrained therein. No. 1,994,055. John Gordon Thomas, New York City.
Preparation water purifying material, comprising a humic substance which has been treated with an alkaline solution of a metal whose oxides are insoluble in water. No. 1,994,682. George Borrowman, Evanston, Ill.

Chemical Markets & News

Tercentenary Celebration climaxed by the Addresses of William B. Bell and Lammot du Pont before 4,000 Attending the Chemical Industries Symposium—Father Nieuwland Receives the Nichols' Medal—Senator "Pat" Harrison and Representative Longworth Speakers at the Society Dinner—Outstanding Papers—

"A moratorium on research." Advocates of this demagogical panacea for raising the country out of the slough of depression obtained a partial gain towards a ridiculous objective in a rather novel and totally unexpected manner when several hundred celebrities—the "Who's who in chemistry," gathered with nearly five thousand of those not so well publicized to celebrate together the founding of a chemical industry on this continent three hundred years ago by one John Winthrop, Jr. Research, if not exactly at a standstill, slowed down perceptibly for the week of the American Chemical Society meeting while chemists, engineers and industrialists took stock of our chemical achievements of the past and attempted to interpret the trends of the future.

There can be little chance of disagreement with the statement that the climax of the meeting came with the outstanding addresses of Lammot du Pont, president of the du Pont Co., and William B. Bell, president of American Cyanamid Co. at the Chemical Industries Symposium attended by over four thousand members.

Mr. du Pont in his paper, "Human Wants and the Chemical Industries" traced the history of the industry from its modest beginnings three hundred years ago, interpreting for his audience the economics of each situation in turn. He quoted almost at once from a speech of Lord Melchett, in which the British chemical industrialist stated that we are "now embarked on an age of plenty, when previously we were confronted with an era of scarcity."

Mr. du Pont then broke down the history of our chemical development into three parts. The first, the development of a heavy chemical industry in this country; second, the growth of a synthetic organic chemical industry, and third, the development of new markets through "customer research" for chemicals.

Taking each in turn, the speaker recalled how the building-up of a large heavy or industrial chemical industry was forced upon us early in our history by the needs of consuming industries for certain chemicals; later, how the shutting off of German dyes compelled us to fashion a self-sufficient synthetic organic division and how, within the past ten years, the chemical industry has assumed the lead and is developing through "customer research" a host of new products that are constantly raising the standards of living and materially aiding our physical and mental well-being.

Mr. Bell, in referring to Mr. du Pont's address, called it, "The most striking document I have ever listened to," and the enthusiastic audience appeared to agree with him thoroughly. Turning to the subject of war, the president of the du Pont Company said:

"At this time, when nations are increasing armaments, it is well to remember that the chemical industry is an important element in the line of the country's defense. Plants which are engaged in the peace-time activity of manufacturing chemicals could be converted quickly into the manufacture of chemicals used for explosives, poison gases and other materials so important in the waging of war.

"Far more important than these physical assets, however," Mr. du Pont continued, "is the available personnel. There are now a large number of chemists, engineers and men trained in the operation of chemical plants, who have a broad experience in chemical manufacture and a knowledge of materials of construction for plants and who could be mobilized to construct and operate the necessary munition plants.

"In the increasing mechanization of modern warfare, new chemical problems would be encountered and new adaptations of chemical materials would be required. The large research organizations of the chemical industry would be invaluable in the study and solution of problems which would inevitably arise. There can be no possible substitute for a strong chemical industry in the manufacture of materials so indispensable for waging war. In this respect the country has been immeasurably strengthened in its defense."

The next speaker, William B. Bell, president of Cyanamid, and president of both the Chemical Alliance and the Manufacturing Chemists' Association, brought forth a roar of laughter from his audience at the outset of his address, which was largely extemporaneous, when he humorously confessed that he knew, per-

"Nothing but a comprehensive system of folly can keep this country from recovery," William B. Bell reports to A.C.S. members gathered in N. Y. City. Seated, left to right, Thomas Midgely, vice-president of Ethyl Gasoline, who startled and amused his hearers with a description of chemistry in the year 2035; President Adams of the A.C.S.; and Lammot du Pont. First speaker was Prof. Alfred H. White, Michigan, who spoke on "The Scientific Foundations of the American Chemical Industries."

To Prof. Arthur W. Hixson, chairman and his various committees; also the publicity committee, headed by D. H. Killeffer, special praise was bestowed by A. C. S. members; also to James T. Grady, managing editor of the A. C. S. News Service. Attendance, a record, reached 5,110; 1,115 attended the Nichols' Medal Award; 2,284 the Society Dinner.

haps, less chemistry than anyone in the room. In his speech, announced as "Recovery—by Alchemy or Chemistry," Mr. Bell excoriated the plans of the present administration for obtaining recovery.

"I have," said Mr. Bell, "turned to the dictionary for the definition of the word "Alchemy" and what do I find?"

"The immature chemistry of the middle ages, characterized by the pursuit of the transmutation of the base metals into gold, and the search for alkahest and the panacaea."

"And a second definition," continued Mr. Bell, "reads as follows."

"Any cunning, mysterious or preternatural process of changing the structure or appearance of things."

Mr. Bell emphatically denied the allegation that we were suffering in this country from over-production. He branded as false the idea that industry—except in railroads, coal mining and oil—had failed to plan properly, that it had invested enormous sums in over-capacity and that it had become obligated to pay interest and dividends on these investments. Quoting from the Brookings Institute "Report on Capacities," the speaker showed that the over-capacity in railroads, coal and oil amounted to only twenty per cent. and that this really was no over-capacity at all when seasonal demands were taken into account. Further, he asked, who could have foreseen the rise of the automobile, the introduction of oil and natural gas, and even the improvements in efficiency in the burning of coal?

National Planning Unworkable

Attacking the theory of national planning as a workable substitute for business planning, Mr. Bell resorted to a very simple hypothetical case of umbrellas and raincoats and again evoked laughter as he concluded, "that we would have Congressman Jones from the umbrella producing sections running on a platform of Jones and more umbrellas and Congressman Smith from the raincoat producing center of the country running on a platform of more raincoats and Congressman Smith."

"The panacea with which today we are most befuddled is national banking," Mr. Bell stated. "What we need most, we are not getting, a law that will deal alike with both the "big" and "little" fellow; a law, such as they have in England, that can be swiftly administered. Size alone is not a crime. It does not matter whether I am five feet tall or six feet in height. It is what I do that counts.

"There are today many individuals, including those who have never been to Russia, Germany or Italy" he said, "who believe that governments can plan better for industry than industry itself."

Among the failures of the New Deal he mentioned attempts to increase purchasing power by increasing wages, saying that it clearly involved increasing prices faster than wages, so that the volume of purchases was cut down and unemployment aggravated.

He estimated that the accumulated demand in the durable goods industries was about $85,000,000,000 — "sufficient, when added to the ordinary consumers' demands of the country, to re-employ the 9,000,000 men now out of employment for from six to eight years. "Nothing," said Mr. Bell in conclusion, "but a comprehensive system of folly can keep this country from recovery."

Garvan Dinner Toastmaster

On Wednesday evening at the Waldorf-Astoria the convention reception and banquet was held with nearly two thousand in attendance and Francis P. Garvan, gifted after-dinner speaker and president of the Chemical Foundation, as toastmaster.

"A nation that can produce all of its own chemicals has a better chance than others in avoiding war," declared Mr. Garvan, recalling an agreement between the chemical industry and the government during the administration of President Wilson in which, in return for embargoes and protection, the industry undertook to make the nation chemically independent, the Foundation head continued:

"We imported last year over $60,000,000 of chemicals, which were sold here for $100,000,000, and until every pound of those imports is made efficiently here the trust is not discharged. We gave our word of honor and it is still our word of honor.

Senator "Pat" Harrison devoted most of his prepared address to a summary of the natural resources of the South and described the region as "the foundation of raw material for any further development of the coal tar industry" and pictured the many advantages that were awaiting the chemical industrialist who turns to that region in the future for erection of new plants. Mr. Wadsworth, congressman from upper New York State, expressed the hope that "the government will get behind a well-considered and comprehensive growth for the chemical industry, and without governmental interference." He brought a round of applause when he referred to Senator Harrison's remarks on the growth of a tung oil development in the South. "Let's hope," he said, "the government doesn't hear about them and start plowing them under."

Fr. Nieuwland Nichols' Medalist

Attendance at the dinner in honor of Father Julius Arthur Nieuwland, discoverer of the basic chemical principles upon which the new synthetic rubber industry is founded, reached well over one thousand. The noted priest from Notre Dame received the coveted Nichols medal for chemical achievement from the hands of Dr. John M. Weiss, chairman of the jury of awards, who called the noted scientist, "a soldier of science." The work of Father Nieuwland was lauded by Dr. E. R. Bridgwater of the du Pont Co. and the personal side of Dr. Nieuwland's life was initimately disclosed by his close associate, the Rev. Eugene P. Burke, C.S.C. of the Arts Faculty of the University of Notre Dame.

Economics Symposium Disappointing

Somewhat disappointing was the attendance at the symposium on chemical economics, and the hoped-for discussion from the floor failed to materialize. The very splendid paper by Dr. L. H. Baekeland, "Impress of Chemistry on Industry: Bakelite, an Example," was followed by one on "Chemical Prices: Their Recent and Future Trends," by Dr. Melvin T. Copeland, professor of marketing in the Business School of Harvard University. Dr. Copeland forecast much higher living costs and sympathetic advances generally in chemical prices if the administration continued indefinitely along its present paths and refused to consider the balancing of the budget. He challenged the chemists of the nation to find new industrial uses for silver and in this way remove silver from the political arena.

The remaining papers delivered at the symposium included "Depreciation and Obsolescence Charges in the Chemical Industry: How Affected by the New Deal," by Joseph J. Klein, and "The Autarchy Policy: An Appraisal of the Trend toward National Self-Sufficiency," by Frank Howard of Standard Oil.

Outstanding Papers

Chemists and chemical engineers hailed as one of the outstanding papers that of Dr. Walter J. P. Podbielniak of Chicago presented before the Petroleum Division, in which he reported that the force of gravity is multiplied a thousand times in a new distilling device described for the first time.

This multiplication was explained by the statement that falling body, motivated by the force of gravity, travels 32 ft. the first second of its descent—imagine it falling 32,000 ft. a second.

Dr. Podbielniak calls his invention a "super contactor." It is the result of many years of work in his Chicago laboratories. Dr. Podbielniak is well known for his research and development work in the petroleum and chemical industries. Centrifugal force, the whirling destruction of the cyclone, is the power he has harnessed to do useful work by a method never before employed.

Other papers of note: "New Method of Making Heavy Water," By Dr. D. S. Cryder of Penn State; a new gasoline described by Dr. Gustav Egloff as being made by a process known as "Polymerization"; and "Indium-New Chemical Developments," by Dr. W. S. Murray.

Obituaries

¶*A. E. Convers, One of Triumvirate that Made Dow Chemical Great, Succumbs to Sudden Heart Attack—Alfred I. du Pont Dies at His Estate, "Epping Forest"—*

A. E. Convers, 76, president of Dow Chemical for the first 21 years of its existence and since '18 chairman of the board, on Apr. 10, following a heart attack, at Taunton, Mass. He left Midland on a business trip on Mar. 28 apparently in the best of health. In 1887 Mr. Convers then in the tack business met Dr. Herbert H. Dow in Cleveland, where the latter was then developing his process for a cheaper extraction of bromine from Midland County brine. Ten years later he was the 2nd to subscribe money with which the now famous Dow organization was started. The history of the Dow Co. is largely the story of the friendship of Dow, Convers and Pardee, who now succeeds to the chairmanship of the Board.

Though Mr. Convers consistently disclaimed credit for promotion of the Dow company which grew from nothing to a giant industry during his years as president and board chairman, other Dow officials accord him unmistakably tremendous official significance based on a more than exceptional ability as an experienced manufacturer.

Reorganized du Pont Co.

Alfred I. du Pont, 70, reorganizer and former head of the du Pont Co., on Apr. 29, suddenly from the effects of a heart attack suffered a few days previously. He took over the du Pont organization in '02 and in 14 years built it up into a $82,000,000 corporation. In '16 a disagreement took place, and after a stock battle, control passed to his cousins, Pierre, Irenee and Lammot. Alfred du Pont then retired from the company, although he remained one of the largest single stockholders.

Carillon for "Nemours"

Work had only been started on construction of a carillon tower at "Nemours," the property of the late Alfred I. du Pont. This will be one of the largest private construction projects engaged upon in Delaware in recent years. The ground has been broken for the foundations of the tower, the plans for which were recently completed by the architectural firm of Massena and du Pont. The carillon will provide a final resting place.

Dr. Ernst Bischoff

Dr. Ernst Bischoff, 71, founder of Ernst Bischoff Co., N. Y. City, manufacturer of specialities, on Apr. 19 of a cerebral hemorrhage. After an extensive technical education in Germany he came to this country in 1892 and with a brother formed the Carl Bischoff & Co., manufacturers and importers of coaltar chemicals and dyes. In '98 he started his own firm, and entered into the production of pharmaceutical specialties on a large scale.

York Chemical Wks. Founder

Charles H. Dempwolf, 85, president of York Chemical Works, on Apr. 23, following an illness of only a few days. He came to this country at the age of 17 from Germany, studied chemistry at night at Cooper Union, and then formed the firm of C. H. Dempwolf & Co., which he later changed to York Chemical Works when he expanded the products into fields other than fertilizers.

Edgar Field Price

Edgar Field Price, 62, a former Carbide vice-president, and one of the group who was largely responsible for the development of acetylene, on Apr. 15. Discovery was made quite by chance and is described in detail in the Carbide story in the Tercentenary Supplement in this issue on p. 129.

March Frederick Chase

March Frederick Chase, 58, chief of the explosives branch of the War Industries Board during the World War, later a noted consultant, and more recently a Commercial Solvents' vice-president, on May 1.

His Papers Were Undelivered

Dr. Jesse Erwin Day, 47, professor of chemistry at Ohio State, and a nationally known scientist, Apr. 20, of a heart ailment at his home in Columbus. He had planned to deliver 4 addresses before the A. C. S. in N. Y. City.

Discoveries made by Dr. Day during his research work on the catalytic combustion of carbon are said to have been of notable value in smoke prevention.

Dr. Day became ill after delivering an address before the Ohio Academy of Science at Ohio State University.

Dean of Pacific Coast Circles

Charles W. Hill, 66, well-known in Pacific Coast chemical circles, on Apr. 21. He was the dean of the industry and was affectionately known to his wide circle of friends as "Charley." After 10 years with Michigan Drug he migrated to California and became connected with Braun Drug and later the chemical department of the Braun Corp. He then joined California Drug and Chemical. A few years later he started the C. W. Hill Chemical Co., which he later sold to the Los Angeles Chemical Co. Hill Bros. Chemical was formed by his 2 sons and he soon joined them. His youngest son, Clifford, died 2 months ago, and his wife in November of last year.

Mrs. Augusta S. Anderson

Mrs. Augusta S. Anderson, 74, wife of John Anderson, chairman of the executive committee of Charles Pfizer, on Apr. 8. She leaves, besides her husband, a son, George A. Anderson, a vice-president in the Pfizer organization. She was very active in Brooklyn philanthropic movements and in church work.

Other Deaths of the Month

James R. Knapp, 56, Carbide's general counsel, on Apr. 28.

Robert William Joseph Kendall, 39, an official of du Pont's N. Y. City Cellophane division, on Apr. 28.

COMING EVENTS

Joint Production and Chemical Conference, American Gas Association, N. Y. City, May 13-15.

American Institute of Chemical Engineers, spring meeting, Wilmington, Del., May 14-16.

Associated Cooperage Industries of America, Hotel Jefferson, St. Louis, May 14-16.

American Petroleum Institute, mid-year meeting, Tulsa, Okla., May 14-16.

Maryland-Delaware Water and Sewage Association, Annapolis, Md., May 16-17.

Boston Rubber Group, May 17.

Annual Convention, American Institute of Chemists, Hotel Claridge, Atlantic City, May 18.

20th Annual International Convention and Inform-a-Show, National Association of Purchasing Agents, Waldorf-Astoria, N. Y. City, May 20-23.

American Society of Refrigerating Engineers, annual convention, Statler, Detroit, May 22-29.

Refrigerating Machinery Association, The Homestead, Hot Springs, Va., May 23-25.

National Association of Insecticide and Disinfectant Manufacturers, semi-annual meeting, Edgewater Beach Hotel, June 10-11.

American Association of Cereal Chemists, Denver, June 4.

Canadian Chemical Association, Kingston, June 4-6.

Synthetic Organic Chemical Manufacturers' Association, June outing, Skytop Lodge, Skytop, Pa., June 6-8.

Manufacturing Chemists' Association, annual meeting, Skytop Lodge, Skytop, Pa., June 6.

American Electroplaters' Society, annual meeting, Bridgeport, Conn., June 10-14.

National Fertilizer Convention, White Sulphur Springs, June 10-12.

American Leather Chemists' Association, Annual Convention, Skytop Lodge, Skytop, Pa., June 12-14.

Twelfth Colloid Symposium, Cornell, June 20-22.

American Society for Testing Materials, annual meeting, Book-Cadillac, Detroit, June 24-28.

Penn. Sewage Wks. Association, State College, Pa., June 24-26.

International Agricultural-Chemical Congress, Brussels, Belgium, July 15-28.

A. C. S., 90th Meeting, San Francisco, week of Aug. 19.

Technical Association of the Pulp & Paper Industry, fall meeting, Atlantic City, week of Sept. 16.

Electrochemical Society, semi-annual meeting, Washington, D. C., Oct. 10-12.

Second Annual Convention, National Paint, Varnish and Lacquer Association, Mayflower Hotel, Washington, Oct. 30-Nov. 1.

In connection with the convention the "Paint Show" will be held Oct. 28-29 at Washington.

American Petroleum Institute, Biltmore Hotel, Los Angeles, Nov. 11-14.

Exposition of Chemical Industries, Grand Central Palace, N. Y. City, Dec. 2-7.

Sixth National Organic Chemistry Symposium, Rochester, N. Y., Dec. 30.

Chemical Engineering Congress, Central Hall, Westminster, England, June 23-27, 1936.

LOCAL TO NEW YORK*

May 17. Joint meeting, Electrochemical Society in charge.

May 24. N. Y. State Sewage Works Association, Poughkeepsie, May 24-25.

Secretaries of Chemical Associations and Groups allied to chemistry (also the process industries) are urged to make use of this column.

*** Chemist Club unless otherwise stated.**

William J. Barton, 76, senior partner of J. H. Barton & Son Fertilizer, Baltimore, on Apr. 15, of a heart ailment.

Charles B. Kendall, 70, prominent textile chemist and superintendent of Acme Finishing, Pawtucket, on Apr. 11.

Charles August Paeschke, 77, president, Geuder, Paeschke & Frey Co., manufacturer of steel pails, on Apr. 28 at his home in Milwaukee.

Percy Procter, 83, one of the founders of P. & G., on Apr. 30.

Charles Frederick Cross, 79, codiscoverer of viscose, in England on Apr. 15.

R. T. Paessler, well-known chemical consultant in Wilkes-Barre, on Apr. 14.

Foreign

¶Chemical Progress in Russia—I. C. I. Financial Structure—British Societies Form "Super" Committee—Bosch New I. G. Chairman—

"Chemicalization" of the Union of Socialist Republics has made considerable progress in recent years, though the country is still deficient in many important chemicals according to Soviet official reports. Special attention has been given to production of sulfuric, nitric, hydrofluoric, and nitric acids; caustic; sodium carbonate and bicarbonate; caustic potash; sodium sulfide, sulfate, bisulfate, sulfite, and silicate; potassium chloride; calcium hypochlorite; and calcium carbide—basic in the production of innumerable manufactured articles.

Production which amounted in value to only 90,000,000 roubles in '28 was increased to 242,700,000 roubles in '33 and in '34 a further increase to 328,700,000 was planned.*

While no figures are available, production of other chemicals, including coal tar products, dyes, wood chemicals, fertilizers, matches, paints and varnishes, medicinals and toilet preparations, has also made progress, judging from the sharp decline in imports of such commodities.

Reports indicate that a number of new plants have been established during the past year. In March, '34 a carbon black plant began production, and before the end of the year 2 more plants were established bringing production during the year to 8,848 tons. In September, '34, a synthetic methanol plant started producing for the first time in Russia.

Among other new chemical enterprises were included 3 wood distillation plants; new calcium carbide, copper sulfate, and natural dyestuffs plants erected in Transcaucasia; and in the Crimea, an acetone and butanol, and a sulfur plant began operations. The old "picturization" of Russia contained in grade school geographies, portraying a peasant guiding a plow dragged by downcast females, depicting an essentially agricultural nation is now passé—the Soviet is practising "chemicalization" and is eager not only to become self-sufficient but a factor in narrowing export markets of the world.

* Value of rouble in '34, 87c; in '33, 51c.

Soviet reports plans for a new formaldehyde plant (using the catalytic oxidation of methane by pure oxygen or air method); also the first unit of a bichromate factory at Eriwan (Armenia), with a 2nd unit to follow shortly, output to be used in a synthetic rubber plant to be built at the same point.

Object to Proposed Stock Structure

Efforts of directors of I. C. I. to consolidate deferred and common shares will meet with opposition on the part of a group of deferred shareholders who unanimously resolved to oppose the plan when it comes before the courts for confirmation.

A poll conducted at the meeting showed 22,871,043 shares voted in favor of consolidation and 2,127,855 voted against the scheme. Sir Harry McGowan, chairman, overruled a previous show of hands vote which defeated the consolidation resolution and demanded a poll. The chairman intimated that the board held a sufficient number of proxies to pass the consolidation measure. It was following the poll that disgruntled shareholders met to appoint a committee to lead the fight in opposition.

Regarding new products, Sir Harry mentioned that in association with Imperial Smelting Co., British Aluminum Co. and Magnesium Metal & Alloys, Ltd., Imperial Chemical was taking a part in developing production of metallic magnesium.

Production of gasoline by hydrogenation is proceeding satisfactorily and it is now anticipated that new capital expenditure by Imperial will amount to £3,000,000, an increase of £500,000 over the figure given last year, but on the other hand the plant will have an output capacity of 150,000 tons of gasoline annually or 50% in excess of the original estimate. The whole operation should be working by the close of May. The first cargo of 300,000 gallons of number one grade gasoline left Billingham Apr. 10.

The First Step

Closer cooperation is promised by the draft of an agreement between The Chemical Society (founded in 1841), the Institute of Chemistry (1877) and the Society of Chemical Industry (1881). It is hoped to concentrate efforts, prevent a great deal of duplication and to promote efficiency. Industry will be temporarily represented in the new Chemical Council by 3 members designated by the Association of British Chemical Manufacturers until some definite plan can be formulated. The plan is the culmination of years of effort. Idea is creating quite a stir in the U. S., where somewhat analogous suggestions of closer cooperation and possible amalgamation of societies has been discussed over a long period.

New Alkali Production

A small alkali plant is planned in Cuba, to be erected near Sagua la Grande.

First caustic plant in western Mexico is being erected at Guadalajara.

Canadian Industries' new alkali plant at Cornwall, Ont., went into production Mar. 11.

Foreign Notes

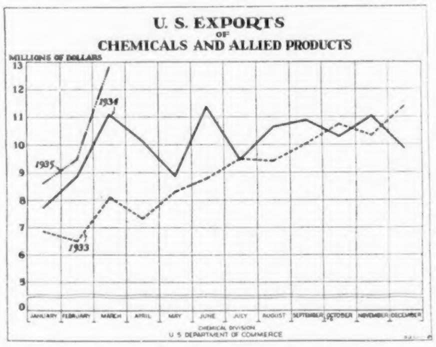
Dr. Carl Bosch succeeds the late Dr. Carl Duisberg as chairman of the advisory board of the I. G.

Sakai Kagaku K. K. will erect a titanium white plant with an intial output of 800 tons annually.

Foreign Trade

¶U. S. Exports "Top" Imports by $1,000,000 in First Quarter—Both Gain Over '34—Italian Mercury Exports—Jap Sulfate of Ammonia Shortage—

Exports of chemicals and related products continued to increase during March and were valued at $12,805,000, an increase of 15% over the same month last year, and 58% higher than for March, '33, according to C. C. Concannon, chief, Chemical Division, Bureau of Foreign and Domestic Commerce.



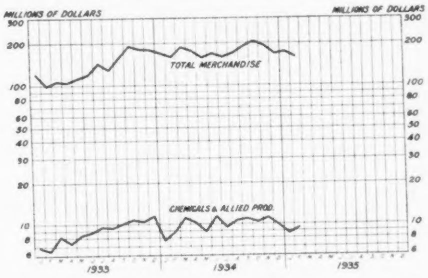
Almost all major commodities except certain fertilizers, coal tar products, and sulfur shared in the gain, particularly high grade paint, medicinal, and chemical specialties.

During the first quarter of '35 exports of chemicals and allied products were valued at $30,850,000, according to preliminary statistics. Industrial chemicals which include such items as acids, alcohols, sodium compounds and gases increased 17% to $5,746,700 in the first 3 months of '35 compared with the corresponding period of '34. Foreign shipments of naval stores, gums, and rosins increased 10% to a total of $3,705,000, due largely to heavier exports of rosin, as the foreign demand for American turpentine has been weak.

Paint and pigment exports have been particularly active since the beginning of

the year, total reaching $3,672,000 during the first quarter, an increase of 28% over the corresponding period of '34.

Other items showing increases during the period under discussion included me-



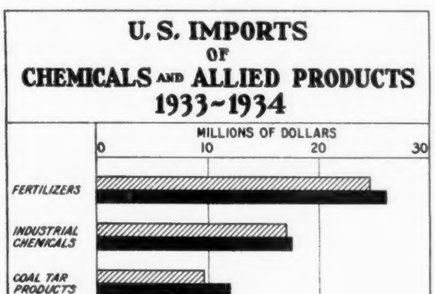
Total U. S. exports of general merchandise and chemicals and allied products compared

dicinals and pharmaceuticals valued at $2,971,000 an increase of 20% compared with the first 3 months of '34; industrial chemical specialties increased more than 12% to $3,258,000; toilet preparations, 16% to $1,313,600; pyroxylin products, 3½% to $1,002,000; essential oils, 26%; industrial explosives, 46%; and crude drugs, 70%, statistics show.

Among major classifications registering losses were coal tar products, 17%; fertilizers, 24½%; and sulfur, including both crude and refined, 24%.

First Quarter Imports

U. S. first quarter imports of chemical and allied products ($29,745,000) increased 11% over last year, due to heavier receipts of raw materials. In former years chemical imports during the first quarter generally exceeded exports; in '35, however, exports exceeded imports by more than $1,000,000.



Fertilizer materials as usual, predominated ($9,373,000) during the first quarter, accounting for almost one-third. Total value of fertilizer imports changed little compared with '34 but considerable fluctuation occurred among the individual fertilizer materials received, notably crude potassium chloride which almost doubled in quantity to 70,000 tons, while the value advanced only slightly to $1,368,000.

Industrial chemical imports increased 12% to $4,266,360, while receipts of coal tar products increased 33% to $3,688,964. In the latter classification, dead or creosote oil increased 86% in quantity to 9,608,000 gals. and 116% in value to $925,700. Receipts of dyes, colors and stains were also substantially higher, both in quantity and value.

Italian Notes

Italy exported 1,059 tons of mercury in '34 against 1,039 in '33. Italy will have a new oxalic acid factory at Milan, erected by Soc. Anon Aziende Colori Nazionale Affini. The following figures show exports in '34 and '33 of citric and tartaric products. Figures are in tons, and those in parentheses relate to '33: Tartaric, 1,615 (1,960); crude tartar, 5,565 (9,172); wine lees, 55 (933); cream of tartar, 863 (731); citric, 2,229 (1,960); and calcium citrate, 1,882 (1,576).

Japanese Developments

It is reported that a Japanese shortage of 130,000 tons of sulfate of ammonia is predicted by the end of June and that already orders for 100,000 tons have been placed with foreign suppliers.

Japan with an excess output of 130 tons of acetylsalicylic acid is said to be looking for outlets.

Customs and Tariffs

¶A Decision on "Duress Entries" Favors Importers—

Importers of sodium silicofluoride were victors before the Court of Customs & Patent Appeals on Apr. 8 when the Court failed to reverse the decision of the lower court on the question of "duress entries." The question was whether entries should be liquidated at the so-called "importers' claimed values" of 4¼c per lb. or at the final appraised value of 4c. Question is important and the decision of the higher court is therefore valuable for future guidance. Material was entered under duress, that is, at the time it was entered for consumption the importer certified that the entered values were higher than the values defined in the law as the basis of duty assessment, and that it was so entered in order to meet advances by the appraiser in a similar case then pending on appeal to reappraisement. The government, on the other hand, contended that the higher value should be used. The Appeals Court's decision was based on an interpretation that the Tariff Act required that the final appraised value was the value that should govern.

Brazil Lowers U. S. Rosin Rate

U. S. rosin now carries a lower rate into Brazil, as a result of the recent trade agreement between the 2 countries.

Associations

¶M. C. A. Meets at Skytop in June—Derby Speaks at Philadelphia—Interesting Programs for A. S. T. M.; A. I. C.—Allen to Talk to "P. A.'s"—

Manufacturing Chemists' Association and the Synthetic Organic Chemical Manufacturers' Association will again convene at Skytop (Skytop Lodge) early in June. The annual meeting of the M. C. A. will be held from the 6th to the 8th. Cyanamid's new vice-president and director and former director of the budget, Lewis W. Douglas, will be the principal speaker at the joint dinner on June 6 when the S. O. C. M. A. will be host. The annual golf tournament will be held on the following day. Reservations now received indicate that a record attendance will be present for both the business sessions and the various social affairs.

Another Return Engagement

The unusual attractions of Skytop are also luring back the leather chemists for a "return" engagement and the annual meeting of the American Leather Chemists' Association will be held there on June 12 to the 14. Outstanding speakers will address the meetings.

Philadelphia Club Luncheon*

H. L. Derby, Cyanamid & Chemical president, was the April speaker before the very greatly enlarged Philadelphia Chemical Club. Walter E. Wright, Harshaw Chemical, vice-president of the Club acted as toastmaster. At the guest table besides Mr. Derby were: Leonard T. Beale, president, and N. E. Bartlett, vice-president of Penn Salt, Dr. Finn Sparre and Milton Kutz of the R. & H. Chemicals Division of du Pont, and Williams Haynes, publisher of CHEMICAL INDUSTRIES, who stopped off in Philadelphia in the first leg of a Southern visit.

A. S. T. M.'s Stiff Program

In order to provide ample time for the presentation of the many technical reports and papers which will be presented at the 38th annual meeting of the A. S. T. M. to be held in The Book-Cadillac, Detroit, June 24-28, 16 sessions are scheduled. During the 5 days of the annual meeting, the Society's 3rd Exhibit of Testing Apparatus and Related Equipment will be in progress. Latest developments in the testing and scientific instrument field will be on display and A. S. T. M. committees and research laboratories will also take part.

A. I. C. to Atlantic City

American Institute of Chemists members gathered at luncheon on Apr. 25, during the week of the A. C. S. meeting. Frank R. Breyer acted as toastmaster.

* Club will golf first time in its history May 28.

President Crossley, chief chemist of Calco Chemical, spoke, urging a large attendance at the annual meeting. Mr. Breyer then reported at length on the general subject of unemployment and was followed by Prof. Marston T. Bogart and Dean Lipman of the N. J. State Agricultural School at Rutgers. A general discussion then followed on what part the Institute should play in unemployment; the professional status of chemists, and what could be done for the laboratory worker and technician who are not eligible for membership. Representatives from the Philadelphia and Niagara Falls Chapters were present.

The annual convention will be held at the Claridge at Atlantic City over the week-end of May 18-19, thus giving members an opportunity for more social activities than have heretofore been possible at the annual meetings held in N. Y. City.

National P.A's to Meet

Mathieson's president, E. M. Allen, will deliver an address before the National Association of Purchasing Agents at the annual convention scheduled for the Waldorf, May 20-23. Mr. Allen will speak on the opening day on the subject of "Heavy Chemicals."

McCartney Heads Chicago D. & C. A.

Frank L. McCartney of Norwich Pharmacal heads the Chicago Drug & Chemical Association; vice-president is A. J. Rocco of Gazzalo Drug & Chemical; treasurer, William B. Erb of Kimball Glass; and secretary, A. C. Stephen, Jr., of Chemical Distributers, Inc. A May party was held May 2 at the Lake Shore Athletic Club.

Dr. Ezekiel Lectures

Dr. Mordecai Ezekiel lectured before the Washington A.C.S. section on April 11 on the fundamentals of economics and how the New Deal proposes to correct "mal"-distribution. Dr. Ezekiel is economic advisor to the Secretary of Agriculture. In July of last year Chemical Foundation Head, Francis P. Garvan, attacked the economist for opposing the development of a paper pulp industry in the south. (C. I., July '34, p19.)

Attention Chemical Librarians!

Special Libraries Association will hold its 27th annual convention in Boston June 11-14 at the Statler. Chemical libraries have so large a representation in the Association that their librarians have formed a Chemistry Section of the Science-Technology Group. Chairman is Mrs. Hester A. Wetmore, Merck librarian.

Steik on "White Oils"

Dr. Karl T. Steik, National Oil Products' director of research, talks on "White Oils" before the April meeting of the N. Y. Section of the Textile Chemists and Colorists.

"Diffusional Processes"

Society of Chemical Industry and cooperating societies heard Prof. Walter G. Whitman of M. I. T., deliver a paper on the subject "Diffusional Processes," a discussion of the transfer of material and the transfer of heat from one phase to another.

Association Notes

The A. I. Ch. E. is granting a charter for a Maryland section, with Dr. W. J. Huff, Johns Hopkins, as chairman.

The National Association of Insecticide & Disinfectant Manufacturers will vote on the adoption of a new emblem.

Personnel

¶Pardee Is Now Dow Chairman—Doan Is Elected a Director — R. M. Roosevelt Heads Titanium Pigments—Other Personnel Moves—

James T. Pardee, vice-president and secretary of Dow Chemical, is now chairman of the Board, succeeding the late A. E. Convers. Mr. Pardee was a member of the original Dow board; before that he had been secretary and treasurer of the Dow Process Co., which preceded the Dow organization. The late Dr. Herbert H. Dow and Mr. Pardee were classmates at the Case School of Applied Science in Cleveland.

At the same meeting Leland I. Doan, Dow sales manager, was elected a director of the company. Mr. Doan joined the Dow organization in 1917.

His first year's work was done under Dr. L. G. Morell in the chlorine cell production; his 2nd year under Thomas Griswold, Jr., in engineering; then he was transferred to the sales department, where for 5 years he served under G. Lee Camp, spending his time on the road in the interests of industrial chemicals. At the end of that period he was made assistant sales manager, serving as such until Oct. 1, 1929, when he became general sales manager, which post he still holds.

Mr. Doan's brother, Wilson Doan, is connected with the southwestern Dow plant at St. Louis.

Titanium Pigments Elects

Titanium Pigments' new head is Ralph M. Roosevelt. W. F. Meredith, former president, is now chairman of the board. Mr. Roosevelt was formerly vice-president of Eagle-Picher Lead and recently retired as president of the American Zinc Institute. He assumed his new office May 1 with headquarters at 111 Broadway, N. Y. City.

A. C. S. Prize Winner with Esselen

Dr. R. M. Fuoss, winner of the A. C. S. Prize Award for '35, joins the staff of Gustavus J. Esselen, Inc. in an advisory capacity. In the fall and winter of '33-'34 Dr. Fuoss was international research fellow at the University of Leipzig with Prof. Debye and last summer he was international research fellow at Cambridge University with Prof. Fowler.

"Just Easing-up a Bit"

Adolph Fuchs, Imperial Color's Chicago representative, announces that he is far from retiring—just "easing up a bit." He will call on old friends and customers when the mood strikes him. E. H. Pennebaker goes from the St. Louis office to Chicago.

April's List of Changes

J. H. Heroy and F. W. Judson are new Pittsburgh Plate Glass directors.

Robert H. Morse, president of Fairbanks, Morse, is a new director of Compressed Industrial Gases.

Homer Easterday is the new eastern division manager for Anderson-Prichard Oil at Akron, Ohio. John Licata is now sales manager.

Albert T. Nanovic, formerly N. J. Zinc, is now Cleveland representative for Imperial Color.

Clark H. Bennett, formerly Standard Varnish, is now on Beck, Koller's technical staff.

L. M. Aycock, American Potash & Chemical, is now at the Atlanta office.

Charles L. Faust (Ph.D. Washington University, '34) is now an electrochemist at the Battelle Memorial Institute of Columbus, Ohio.

Thomas W. B. Welsh resigns from Carbide's research staff to open a laboratory at 114 E. 32 st., N. Y. City.

W. B. McCluer, formerly of Penn State, is now in charge of Kendall Refining's research at Bradford, Pa.

Newsman W. Adsit is new N. J. Zinc treasurer, succeeding the late Henry Steele Wardner.

Dr. John Chipman, resigns as research engineer in the Dept. of Engineering Research at the University of Michigan to become associate director of American Rolling Mill's research laboratories.

Philip J. Kimball is now sales director and William H. Ward is now assistant general manager of the du Pont explosives division.

William L. Helm, a son of one of the founders of Columbian Carbon, is elected a director.

Samuel S. Gutkin, formerly with Cyanamid's rezyl division, is now with the N. Y. City consultants, Barsky & Wilson.

Equipment Co. Personnel

Oliver F. Redd is now connected with Patterson Foundry & Machine's research department. He was formerly with Bell Telephone "Labs"; later with Western Electric at Chicago. He will cooperate in research work on mixing, agitating, grinding and other similar problems and in design and modification of equipment for the process industries.

Worthington Pump's special engineer, J. E. Holveck, operating from the Pittsburgh office, extends his activities to Cleveland, Detroit, Chicago and Buffalo offices.

A. J. O'Leary is now assistant to the general manager of sales of Lukens Steel.

Personal

¶*Industrial Executives Attend A. C. S. Meeting in Large Numbers—Noyes Priestley Medalist—Lidbury Wins Schoellkopf Award*

Industrial executives were present at the recent A. C. S. meeting in large numbers. Among those seen at the gathering either in the lobby of the Pennsylvania or at the Thursday Symposium at which President Bell of Cyanamid and President du Pont of the du Pont Co., spoke were: Willard Dow, president of Dow Chemical; Dr. Herbert H. Kaufman, president of Mutual Chemical, accompanied by George Bennington, vice-president in charge of sales, and Herbert Kaufman, Jr., a chemical engineer at the Jersey City works of the Company; Dr. Walter S. Landis, Cyanamid vice-president, and others too numerous to mention. An even greater number were present at the reception and dinner held at the Waldorf in the evening.

Midlanders Attending

Besides Mr. Dow other Midlanders present were Donald L. Gibb, W. R. Collings, John J. Grebe, Dr. E. C. Britton, A. W. Beshgetoor, and W. M. Murch. Arthur W. Winston, J. B. Reid and W. H. Gross of the metallurgical division were also in the Dow Chemical contingent at the meeting.

Wilmington Delegation

The large du Pont party, led by President Lammot du Pont, included Dr. Charles Lee Reese, Sr., a past president of the Society; L. A. Wetlaufer and J. B. McGregor, of Philadelphia; J. Herbert Lowell, Parlin, N. J.; Dr. Ivan Gubelmann, Wilmington; Dr. Elmer O. Kraemer and Dr. William D. Lansing, Wilmington; R. H. Sayer, Wilmington; Dr. W. F. von Oettingen, director of the Haskell Laboratory of Industrial Toxicology, Wilmington; Dorman McBurney, Newburgh, N. Y.; C. F. Rassweiler, Philadelphia; V. L. Hansley, Niagara Falls, N. Y.; J. F. Broeker, Newport; E. R. Bridgewater, Wilmington; Dr. Donald Milton Smith and W. M. D. Bryant, Wilmington; Dr. E. W. Bousquet, Wilmington; Dr. H. F. Dietz, Cleveland, Ohio; Dr. P. L. Salzberg, Wilmington; Dr. R. M. McKinney and Dr. W. H. Madson, Baltimore.

5th Famous Chemist

William Albert Noyes, emeritus director of the laboratories of the University of Illinois, has been awarded the Priestley Medal, highest honor of the A. C. S., which is bestowed every three years "for distinguished service to chemistry." Award will be made at the 90th meeting of the Society to be held in San Francisco next August. Dr. Noyes, 78 years old, is the 5th famous chemist to receive the Priestley Medal.

Two Niagara Falls Pioneers

Each year the Western N. Y. Section of the A. C. S. recognizes the spirit of research in industry by presenting the Schoellkopf Award, in honor of that Niagara Falls chemical pioneer, Jacob F. Schoellkopf, Sr.

In 1903 a very quiet, unassuming Englishman arrived at the Falls to become chief chemist of Oldbury Electrochemical. Within 2 years he was works manager and in '23 was elected president and general manager. On May 7 he modestly accepted the Schoellkopf Medal, minimizing the importance of his scientific accomplishments.

But to those intimately connected with the chemical industry for the past quarter of a century the contributions of F. Austin Lidbury to the advancement of chemical manufacture and to a proper conception of the importance of research are well-known and require no detailed recounting. Perhaps, most outstanding of all, was his process for the large-scale manufacture of phosgene which he invented, and which he turned over to the U. S. Government for use at Edgewood Arsenal in 1917. To his intimates, however, he is more likely to be thought of as an authority on his 3 hobbies, music, photography and radio.

Douglas Flays U. S. Spending

Lewis W. Douglas, Cyanamid vice-president, and former budget director, was one of the speakers before the National Economy League at its recent meeting held in N. Y. City.

Not Retired

John W. Boyer, vice-president, in charge of sales, Filtration Equipment Co., Cyanamid subsidiary, has resigned and withdrawn—not retired—to his farm "Long Branch" situated 10 miles south of Charlotteville, Va., where with 700 acres partly in wheat and with a 2,000 tree orchard of apples and peaches, he expects still to find time to carry on an aggressive sales agency business in southwestern Virginia.

Landis Pictures Inflation

Dr. Walter S. Landis, Cyanamid vice-president, and a recognized authority on the subject of inflation, spoke before Drug, Chemical and Allied Sections of the N. Y. Board of Trade at a dinner meeting on Apr. 30.

Berman Honored

More than 500 attend the testimonial dinner tendered to Victor H. Berman, president and founder of Onyx Oil & Chemical, Jersey City, in honor of his inductance into office as a member of the Interstate Park Commission.

Urey Defends Pure Research

Dr. H. C. Urey, Columbia, latest Nobel chemistry prize winner, is one of 4 guests of honor at the World Peaceways Dinner at the Waldorf in N. Y. City on Apr. 9, commemorating the 101st anniversary of Nobel's birth. Dr. Urey assailed the idea "that scientific work which is done should have some direct commercial application." Gustav Weidel, Swedish Consul General, condemned "those who say Nobel left the fund for peace to still qualms of conscience because he was a maker of explosives."

Ansbacher Feted

Tribute was paid to David A. Ansbacher for his decade of active leadership in philanthropic activities at a testimonial luncheon given in his honor by the Paint and Chemical Division of the Federation for the Support of Jewish Philanthropic Societies of N. Y. City, at the Metropolis Club on Apr. 12.

Announcement was made of the election of Michael J. Merkin, M. J. Merkin Paint, to succeed Mr. Ansbacher, who is retiring this year as chairman of the Chemical and Paint Division of the Federation after an unbroken record of service as its active head of almost 12 years. Serving with Mr. Merkin will be A. C. Horn, of A. C. Horn & Co., as co-chairman. Mr. Ansbacher will continue his association with the division as its honorary chairman.

Weidlein Chemical Industry Medalist

Mellon Institute's director, Edward R. Weidlein, is announced as the '35 Chemical Industry medalist. Presentation will be made at a Fall meeting.

Zinsser on "Dangerous Liberty"

Rudolph Zinsser, vice-president, William Zinsser & Co., writes on "Dangerous Liberty," in a recent issue of *Printers' Ink*. He deals with inefficient minorities that threatens all industries now that NRA with its restrictions has failed.

Within the Industry

Harry A. Passof, Paramet Chemical vice-president, marries Miss Florence E. Guignon, daughter of C. F. Guignon of Guignon & Green, N. Y. City naval stores factors.

Seen or Heard

Lewis W. Douglas, former director of the budget and now a Cyanamid vice-president, and Francis P. Garvan, Chemical Foundation head, were among the distinguished guests at the annual Gridiron Dinner in Washington.

A. A. Holmes, with U. S. Potash, and one of the most widely known figures in the fertilizer industry, is now "Grandpa" Holmes. Father of the new infant is J. B. Holmes of F. W. Berk & Co., N. Y. City fertilizer dealers.

V. E. "Vic" Williams, Monsanto, was chairman of the golf committee at the

recent American Drug Manufacturers' Association meeting at Hot Springs, and was assisted by Dr. Ralph Dorland, Dow; John Remensnyder, Heyden, Harold Simpkins, Mallinckrodt.

"The Gangplank"

¶*Instals Dorr Equipment "Down Under" — du Pont Officials in Far East Safe—Hardy Sails—*

A. R. Duvall, Oliver United Filters, has recently completed installation and starting up of an Oliver Campbell Cachaza filter at Fairymead Sugar. Queensland, Australia, and has spent the past 3 months in Manila, assisting operators of Oliver equipment in that vicinity. Mr. Duvall expects to spend the next 5 months in Japan and may be reached at the offices of Andrews & George Co., Inc., at Tokyo, where he will assist the local staff and users of Oliver equipment.

D. F. J. Lynch, U. S. Dept. of Agriculture chemist, is in Hawaii to supervise experimental manufacture of cellulose from sugar cane. Dr. Lynch claims development of a new method of obtaining alpha cellulose from sugar cane, the cellulose being of a grade said to be satisfactory for rayon making.

Stating that the company's business was running about 28% ahead of last year, George A. Martin, president of Sherwin-Williams said prior to his sailing in the *Europa,* that there had never been such an opportunity for the paint business as at present.

August Rosterg and other officials of Wintershall & Co., of Kessel, Germany. are here to pick out a distributing point.

A. E. Marshall, noted consultant and president of the A. I. Ch. E., cut short his European visit and returned recently in the *Rex* to preside at the Wilmington meeting of the chemical engineers.

Two du Pont officials, S. K. Varnes and Frederick A. Warden, at first thought to be in the earthquake zone of Formosa, were not near the island. Warren Kinsman is another du Pont official now in the Orient.

Bound East on the Atlantic

Charles Hardy, president of Charles Hardy, Inc., important factor in metals and chemicals, is again in Europe on one of his annual visits. He left in the *Rex* of the Italian Line on Mar. 30 and will be gone 6 weeks. Last year he returned with some very fine photographs, some of which were reproduced in C. I.'s "Roto"

Another eastbound N. Y. City importer is F. Rudloff who sailed for a 6 weeks trip in the Manhattan on Apr. 24.

Also eastbound was A. Olivier of Produits Chimiques du Limbourg in the Lafayette on Apr. 27. Mr. Olivier reports that he expects to return within a few months for another visit.

S. Bayard Colgate, president, Colgate-Palmolive-Peet, sailed recently on a trip to the Far East, accompanied by Mrs. Colgate. They left in the *President Cleveland,* going by way of the Canal.

At the Sign of the Dearborn Inn

A new revolutionary era, an era when agriculture, industry and science will, working together in perfect teamwork, solve most of the problems now apparently so unsurmountable, was envisioned by representatives of all 3 divisions at a meeting sponsored by Francis P. Garvan, Chemical Foundation head, and others, and held at Dearborn, Mich., May 7 and 8. Through the platform of co-operation offered by the sponsors it is hoped to achieve:

1. Gradual absorption of much of the domestic farm surplus by domestic industry.
2. To put idle acres to work profitably.
3. To increase the purchasing power of the American farmer on a stable, permanent basis.
4. To increase the demand for manufactured products which the American farmer wants, needs, and then will be able to purchase.
5. To create new work for idle hands to do, thus, reviving American industry and aiding American labor.

Prominent in the chemical field who were in attendance included: Irenee du Pont; Dr. William J. Hale, chemical consultant, and one of the first to see a perfect tie-up between agriculture and industry (he is the author of several books along these lines); Dr. Charles H. Herty; Dr. E. R. Weidlien; and William W. Buffam. Other branches of industry were represented by outstanding leaders. A number of leading spokesmen for agriculture were present. Willard Dow, president, Dow Chemical, came down from Midland unexpectedly, and attended some of the sessions.*

15th Exposition

When the World War was but a few months old a group of young members of the Chemists' Club in N. Y. were seated about a table in the library discussing the great increase in the number of inquiries received as to where this or that chemical might be purchased, or who made this or that type of equipment, when the suggestion was made by one of the group that certainly the time was propitious to start an exposition—a chemical exposition.

Charles E. Roth, one of the group of young men assisting Dr. William M. Grosvenor, well-known consultant and legal expert, and then serving as librarian without pay, thought so well of the idea that he began to investigate its possibilities in a serious way.

The first chemical exposition was opened on September 20, 1915, with 83 exhibitors and an attendance of 63,000 people, attracted by the wide publicity the industry was currently enjoying because of the prominence of chemistry in warfare. On Dec. 2 the doors of the Grand Central Palace in N. Y. City will open on the 15th in the series of "Expositions of Chemical Industries." According to advance indications the '35 Exposition will be one of the largest in recent years, and the volume of requests for space makes necessary the early preparations which are being made for this year's show. Some of the more pretentious exhibits are being designed and constructed over a period of 8 to 10 months in advance of the Exposition week. Companies leasing the smaller exhibition spaces are making their contracts many months in advance in an effort to secure their particular preference of location with respect to floors, aisles, corners, and entrances. The registered attendance at the Exposition has been more than tripled during the past 10 years, and this year's exhibitors are responding with enthusiasm to stage a series of exhibits so concise, comprehensive, and dramatically appealing as to be unusual business getters.

Unique in the world, the Exposition of Chemical Industries reaches a world market. At the last Exposition, held in '33, the attendance was from 983 cities and towns in 42 states of the U. S. and from 69 cities and towns in 27 foreign countries. The registered attendance was 34,269, representing an increase of 50% over the previous Exposition. Admission is without charge and by registration or invitation only. No tickets are sold.

This year with more than $100,000,000 set aside for new plant projects in the chemical industries, with an unprecedented backlog of research facts available, there is an even more vital selling job that the '35 Exposition of Chemical Industries can perform.

Advisory Council

The Exposition Advisory Committee will include distinguished representatives from all of the leading chemical organizations. The members of the committee are:

A. D. Little, chairman, Arthur D. Little, Inc., Raymond F. Bacon, consulting engineer; L. H. Baekeland, Hon. Prof. Chem. Eng. Columbia; Wm. B. Bell, president, Manufacturing Chemists Association; J. V. N. Dorr, president, The Dorr Co.; A. E. Marshall, president, A. I. Ch. E.; Henry B. Faber, consulting chemist; John M. Alverez, president, Salesmen's Association of the American Chemical Industry; Williams Haynes,

* At this historic meeting held in Dearborn Inn, a replica of Independence Hall, set in Henry Ford's Greenfield Village, harmony prevailed at all of the sessions until the subject of motor fuel was discussed when petroleum spokesmen clashed with agricultural leaders over the use of alcohol in gasoline-alcohol blends. Francis P. Garvan was elected permanent chairman of the conference.

publisher, CHEMICAL INDUSTRIES; Charles H. Herty, industrial consultant; H. E. Howe, editor, *Industrial and Engineering Chemistry*; James H. Crichett, president, The Electrochemical Society; Sidney D. Kirkpatrick, editor, *Chemical & Metallurgical Engineering*; Roger Adams, president, American Chemical Society; L. H. Marks, president, The Chemists Club; W. T. Read, Rutgers; H. J. Schnell, general manager, *Oil, Paint & Drug Reporter*; T. B. Wagner, consulting chemist; R. Gordon Walker, vice-president, Oliver United Filters, Inc.; M. C. Whitaker, vice-president, American Cyanamid; and Fred W. Payne and Charles F. Roth, co-managers of the Exposition.

Companies

¶Carbide Adopts Employee Benefits—du Pont Exhibits at Memphis Cotton Carnival — Acetol Completely Acquired—

At the annual meeting of Carbide stockholders, group insurance, a savings plan and special compensation for employes were approved. J. J. Ricks, president, who favored the program, said it would require a maximum of 7½% of the net income.

Some stockholders protested that the plan was "over-paternalistic."

Mr. Ricks said business in the first quarter of this year was perhaps a little better than in the '34 period.

"King Cotton" and Chemistry

One of the largest displays of products and processes of the du Pont divisions ever shown was seen at the annual Memphis, Tenn., Cotton Carnival in Memphis, from May 6 to May 11. The du Pont Co. issued a special booklet, "Chemistry and the South," copies of which are available at the Wilmington office to C. I. readers.

Now Sole Owner

Du Pont announces purchase of all the assets of Acetol Products, Inc. Du Pont has been a partial owner of this concern since the acquisition of Newport Chemical in '31.

Checking the Companies

Dow Chemical is offering 10 scholarships a year for 5 years to outstanding high school graduates good for full tuition throughout their freshman year at Central State Teachers College.

Binney & Smith's party for rubber chemists and others attending the recent N. Y. City A.C.S. Meeting was held in the Cascade Room of the Biltmore. Over 250 attended.

Pure Carbonic opens a new district office, plant and warehouse at 3200 N. 2nd st., St. Louis, in place of the former East. St. Louis plant.

Pure Carbonic's new Jacksonville representative, J. M. Gray, is located at 617 Fulton pl. A new Pittsburgh warehouse is located at 928 Behan st., but the district offices on "Pureco" gas remain at 1116 Ridge ave., N. S.

Du Pont Co. is acquiring adjacent property to the general offices in Wilmington with an eye to future expansion.

The largest cyanide reduction plant in the West will be located in the Randsburg district of eastern Kern County, Calif., according to the announcement made by Anglo American Mining Corp.

New Incorporations

¶Several New Raw Paint Materials Firms Formed — Sanders Starts New Venture—

R. H. Keene, formerly with the Cleveland raw paint materials dealer, J. C. Drouillard Co., is now opening his own business as the R. H. Keene Co., 1900 Euclid ave. Among his representations are General Plastics and Allied Asphalt & Mineral.

Quaker Mineral Spirits, 1600 Arch st., Philadelphia, is formed by Lyman Quincy, former Sun Oil technical representative.

A. J. Sanders, formerly president of the P. R. K. Chemical Co., Frankfort, Ind., organizes Sanders Color & Chemical.

Other Incorporations

The Paint Products Co., 15,237 Holmur ave., Detroit.

Olson Preservative & Paint Corp., Newark, N. J., Asher J. Cohen, former Woolsey Paint & Color technical director, is president.

The Way Van Products Co., Philadelphia, Clark Cooper, Jr., 1500 N. Mascher st., chemical products at 155 Jefferson st.

Kelly Universal Products, Inc., Greensboro, N. C., to manufacture chemical specialties, $100,000.

Cleveland Soap Manufacturing Co., Cleveland, Ohio.

Spazier Soap & Chemical Co. is a new concern in Santa Monica, Calif. Plant, Colorado ave. and 20th st.

Farmers Fertilizer and Supply Corp., Plant City, Fla., 50 shares, $100 par value. A. S. McMillan, Mrs. A. S. McMillan, W. E. Gamble, directors.

Moves

¶May 1 Being an "Official" Moving Day Address Changes are More Numerous—

Association of American Soap & Glycerine Producers, Inc., moves to 381 4th ave., N. Y. City from 386 4th ave. Change of address also applies to the code authority for the Soap & Glycerine Mfg. Industry, Glycerine Producers Association, Industrial Soap Association, and Cleanliness Institute. The new telephone number is Murray Hill 4-5315.

Offices of John A. Chew, dealer in chemicals and pigments, have been moved from the 8th floor to more elaborate quarters in Suite 1458 in the same building at 60 E. 42 st., N. Y. City.

Bopf-Whittam Corp., manufacturer of wool fat products, is in larger quarters in the Empire State Bldg. Plant is at Westfield, N. J.

Kessler Chemical, solvents, plasticizers, is now located at 1515 Willow ave., Hoboken, N. J., with a telephone number, Hoboken 3-1720. N. Y. customers will get a direct connection by dialing Rector 2-9622.

The McGean Chemical Co. is now at 1106 Medical Arts Bldg., 25 Prospect ave., N. W., Cleveland.

Howard F. Borroto, exporter of chemicals and tanning materials, is now at 17 E. 42 st., N. Y. City.

Ore & Chemical is now at 80 Broad st., N. Y. City.

United Chromium's Detroit office and laboratory are now at 2751 E. Jefferson ave.

Chas. L. Read & Co. is now at 120 Greenwich st., N. Y. City.

Turbo-Mixer is now in enlarged quarters at 247 Park ave., N. Y. City.

Pacific Commercial, importer and exporter, is now at 120 Wall st., N. Y. City.

Plants

¶Niagara Industrial Association Elects—American Chemical Products in New Plant — News from the Manufacturing Centers

Niagara District Chemical and Industrial Association elects the following officers:—President, S. L. Anderson, Thorold, Ont.; vice-presidents, L. G. Patterson and Dr. W. C. Gardiner, Niagara Falls, and C. W. Baker, St. Catharines; secretary, W. H. MacArtney, St. Catharines, and treasurer, J. W. Turner, Merriton.

An Enlarged Plant

American Chemical Products, Rochester, is now in a new and larger plant at 75 Rockwood st., S. J. Cohen, president, reports. Company produces over 400 synthetic organic chemicals and is constantly placing new ones into commercial production.

American Chemical Products' plant on Litchfield st., Rochester, was on fire for 2 hours on Apr. 9 but the blaze was confined to the first floor of the building. Subsequently the company moved into the new plant and manufacturing operations were uninterrupted.

Isco's New Caustic Addition

Isco is building a new liquid caustic addition at the Niagara Falls plant.

Niagara Falls Engineers Elect

At the annual dinner meeting of the Niagara peninsula branch of the Engineering Institute of Canada, held at the Leonard hotel, St. Catharines, on Apr. 13, nominations were received for the executive for the ensuing year, all offices being filled by acclamation.

The executive, for the term 1935-36, will be as follows:—president, S. L. Anderson, Ontario Paper Company, Thorold; first vice-pres., L. G. Patterson, Cyanamid Company, Niagara Falls, Ont.; second vice-pres., D. W. C. Gardiner, Mathieson Alkali Co., Niagara Falls, N. Y.; third vice-pres., C. W. Baker, English Electric Co.; secretary, W. H. Macartney, Guaranty Silk Co.; treasurer, J. W. Turner, Alliance Paper Mills.

Westvaco Takes Klipstein Plant

Westvaco is taking over the old E. C. Klipstein South Charleston plant. Calco Chemical is transferring the manufacture of dyes and intermediates formerly made at the Klipstein plant to Bound Brook.

Dr. E. A. Harding, du Pont's Niagara Falls plant, in charge of that community's charity chest drive, tells workers, "You must do your level best and put the Chest where it should be."

Herman Seydel, president, Seydel Chemical, Jersey City, is granted a patent for an application of chlorinated hydro-carbons in the treatment of sewage, garbage, drains, ditches, etc. He filed his application on Oct. 22, '32. He was allowed 11 claims for originality.

Announcement of the promotion of W. J. Daspit to the superintendency of the Louisiana Chemical Co. is received. Mr. Daspit succeeds Ed Rothrock, who has been given a more important position with the company in Houston. Mr. Daspit has been acting superintendent for several months.

Merck's quinine plant at the Falls of Schuylkill, Philadelphia, was destroyed by fire on Mar. 18.

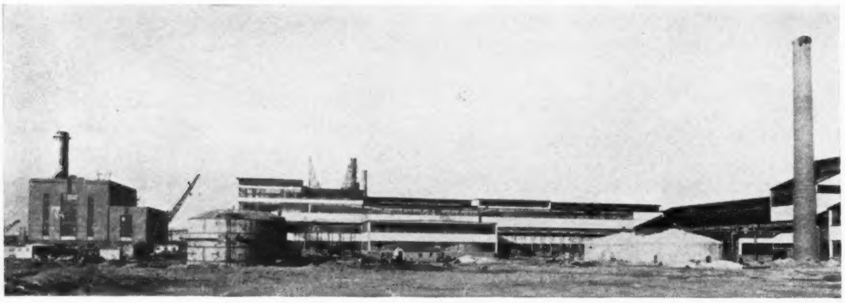
National Aniline's aniline plant at Buffalo was partially destroyed by fire on Apr. 14.

Forest Products Chemical, Memphis, purchases the property of Union Charcoal & Chemical close by and will use it for the sizing department.

Union Carbide's Charleston plant will be represented on the diamond this year in the Municipal League.

Fire destroyed the main building at the plant of the Penn Charcoal & Chemical Co. at Smethport, Pa., on Apr. 12.

The Dorr Co.'s Westport Mill, located on the shore of Connecticut, was menaced by fire Apr. 22. Valuable papers destroyed can be replaced through duplicates in the N. Y. City offices, officials of the company announce.



Newest titanium pigment plant erected by Titanium Pigments at Sayreville, N. J. Ore crushing started Apr. 20 and first chemical reaction the following day

Construction

¶*Carbide Will Begin Expansion of Charleston Plant, June 1*

From Charleston come reports that Carbide is planning to begin work on expansion of the Blaine Island plant about June 1. Expansion of du Pont's Belle plant will start soon. These together with the large construction plan of Westvaco promises plenty of action in the Kanawaha Valley chemical sector.

Litigation

¶*Customs Court Refuses Hearing on Apatite Ruling—V.-C. Directors Obtain Appeal—T. G. Winner—*

U. S. Court of Customs & Appeals has denied the petition of International Agricultural Chemical or other domestic phosphate rock producers for a reopening of the case in which the Court held that importation of apatite from Russia produced by a process which allegedly infringed an American patent was not an unfair method of competition within the meaning of the Tariff Law. A full account of the decision appears in the March issue of C. I., p. 256.

That $7 V.-C. Dividend

Mason B. Starring, George E. Warren, Harry Bronner and Alfred Levinger, all of N. Y. City, directors of V.-C., obtain from the Virginia Supreme Court of Appeals, on Apr. 25, an appeal from a decree of Hustings Court, Part 2, ordering payment of a $7 dividend on the prior preference stock of the corporation.

George S. Kemp of Richmond, another director, brought the original suit to compel payment of the dividend. Petitioning group contends that an actual surplus did not exist at the time set forth in the lower court's decree.

T. G. S. vs. Pabst

Texas Supreme Court decides in favor of Texas Gulf Sulphur in a suit brought by Fred Pabst against the Company, claiming damages in connection with sulfur explorations because the work had not been completed.

Mallinckrodt Wins on Closure

U. S. Circuit Court of Appeals affirms a prior decision in favor of Mallinckrodt Chemical, sustaining the validity of a patent covering a solderless closure for ether cans. U. S. District Court for Western District of Missouri had previously ruled infringement of claims 1 and 2 of the patent by E. R. Squibb & Sons.

Compromise Davison Suit

Compromise settlement has been reached in the long-pending suit of $1,500,000 brought by A. O. Newberry, Mrs. Amanda C. Blades and Mrs. Kate McGehee, both now deceased, and Washington Storage and Transfer Co. against Davison Chemical, its former president, C. Wilbur Miller, of N. Y. and Baltimore, and Meadows Fertilizer of New Bern, charging conspiracy to destroy the former E. H. and J. A. Meadows Fertilizer Co., according to a report in the *Greensboro (N. C.) News.*

Under terms of the compromise settlement, Davidson will pay $50,000 in cash to the plaintiffs, who will receive also one-half of the master's fee from the company and will be allowed a general claim of $125,000 against the company's estate in receivership.

Chemical Employment Gains

Factory employment in the chemical and related industries had a gain from Feb. 15 to Mar. 15, an increase of 3% being reported by the Bureau of Labor Statistics. At the end of the period employment stood 0.1% below the corresponding level for '34. Payroll totals in factories in the chemical group of industries increased 3.1% during the monthly period, and stood 7.9% above the corresponding level of '34.

Bureau's index number for payroll totals in chemical factories was 96.1 on Mar. 15, '35, compared with 93.2 for February, and 89.1 for Mar., '34.

Mill for Southern Pine

Mobile Paper Mill is installing first commercial mill in the South for grinding southern pine. Commenting, Thomas W. Martin of Alabama Power says, "In the years to come we shall look back to '34 as the actual starting point in this most important industry."

Washington

¶*Bell, Cyanamid, Plays an Important Part at Washington Meetings—Unsound Policies Condemned by Business Leaders*

Eyes of the country centered on Washington last month as business leaders gathered for 2 important meetings, the U. S. Chamber of Commerce and the National Association of Manufacturers. Would both organizations follow the conciliatory tone of the American Bankers' Association last year towards the Administration and the more radical "New Deal" policies, hoping thereby to win favor for a more conservative course towards business by the Government and to indicate the advisability of a further swing to the right rather than to the left?

Business leaders did not long leave the issue in doubt. Feeling that the situation called for boldness and decision, the Chamber in no uncertain terms condemned most of the policies on banking, NRA, AAA, securities control, etc., and demanded a new deal out of the "New Deal," one in which business should be left unhampered by unnecessary and unworkable restrictions to bring the country out of the last of the depression.

A "5 Point Recovery Plan"

A vigorous attack upon Administration policies was voiced by President Bell of Cyanamid, also president of the Alliance and the M. C. A., speaking before a luncheon meeting of the Chamber.

Calling for an end to "Government planning and Government squandering," Mr. Bell urged that industry be given a fair and honest opportunity to work under a 5-point program as follows:

"1. Make the Securities Act like the British Securities Act, in which honesty and reasonable care and diligence in the selection of accountants and engineers upon whose figures investors rely are an adequate defense. Encourage adventure, but make it an honest adventure.

"2. Give the courts—not political appointees—the right to try and punish, both as to law and fact, those who are dishonest either in business or banking.

"3. Stop tinkering with the dollar. Uncertainties halt legitimate business.

"4. End N. R. A. Why anyone ever thought it possible to increase purchasing power by increasing wages, when increase in costs will obviously outrun wage costs which are one of the important factors, is one of those mysteries regarding which it is a waste of time to speculate.

"5. End A. A. A. This is one of our greatest creators of doubt and uncertainty, one of the chief retarders of recovery, and one of the greatest threats to American liberty."

Menhadan Interests Meet

Representatives of the menhadan fishing companies met in Washington in the past month to determine their future action on the Bland-Bird House bill, which would tax not only fish meal but ammoniates and tankage 1c per lb. The bill is aimed at imports of Japanese material. A decision was reached to concentrate on getting the provision on meal and against concerted action with other factors that might be interested in the other provisions of the bill.

Latest Legislative Proposals

Rep. John J. O'Connor (N. Y. City) is offering a bill (H. R. 7321) which would exclude from the free list white oils "under whatever name known conforming to petrolatum liquidum U. S. Pharmacopeia, not specially provided for." Passage of such a bill will make such products come under the provisions for medicinal preparations, not specially provided for, which take a duty of 25% ad valorem.

Only recently the U. S. Court of Customs & Patent Appeals reversed the lower court which had decided that a duty of 25% ad valorem was correct, and ruled that the product should come in free as paraffin oil under paragraph 1,733 of the Tariff Act of 1930. The importer in the case was S. Schwabacher & Co., large N. Y. City factor. Among the various arguments advanced by the importer before the Appeals Court was the fact that the largest volume of the material is used in the textile field.

A Naval Stores Division

A bill to create a division of naval stores in the Dept. of Agriculture, to which would be transferred all naval store activities now carried on by various bureaus, is introduced by Sen. E. D. Smith (S. C.).

Alcohol Legislation

A revision of the regulations governing alcohol and alcoholic beverages is the subject of 4 bills (H.R. 7497, 7498, 7499, and 7500, Robt. L. Doughton, N. C.). It is said that they have Administration backing. Attorney James P. McGovern of the Industrial Alcohol Institute is reporting on the contents.

A 4c tax per gallon would be imposed on the first domestic processing of imported molasses to be used for distillation purposes under a bill (H. R. 7813) introduced by Rep. Donald C. Dobbins (Ill.). Tax would be paid by the processor or distiller.

Patents Litigated

U. S. Court of Customs & Patent Appeals denies right to patent, on manufacture of crotonic aldehyde and its homologs, in view of prior art, in appeal of Henri Martin Emanuel Guinot from a decision of the Patent Office.

The Court has affirmed a decision of the Patent Office Board of Appeals rejecting a number of claims of Arnold M. Collins in his application for a patent on improvement in process of mixing synthetic resins, the Court upholding the position of the board that sufficient disclosure was lacking in the application.

NRA

Budgets

Soap and glycerine code authority obtains authorization for a $82,500 budget, while the linseed oil manufacturing group obtains permission for one of $20,000. Chemical Specialties Code Authority asks for an "O.K." on a $10,000 budget.

Code authority for the oxy-acetylene industry applies for NRA permission for a $32,550 budget.

NRA

NRA will permit the insecticide and disinfectant industry to ask code contributions from members for their proportionate share of code expense. Order terminates exemption granted certain members whose principal line of business was other than insecticides and disinfectants.

The lime industry is now operating under a revised code which was approved by NRA on Apr. 1.

NRA reports complaints against saltcake imports are being investigated.

Labor Relations Board

Bemis Bag has been cleared in a ruling by the Textile Labor Relations Board. It was charged that the Company had violated Section 7a of the NIRA by discharging 13 employees following the general textile strike during last September. Board held that the proof was insufficient.

United Color & Pigment must reinstate 15 employees not rehired after a strike last October, the National Relations Board decides, but need not reinstate 20 others.

Trade Commission

¶*Rubber Mfr's Association, Montgomery, Ward, and Duralith Before the Commission—*

Rubber Manufacturers' Association, members of the Mechanical Goods Division of that Association, members and administrative officers of the Master Code Authority for the rubber manufac-

turing industry, and members and administrative officers of the Code Authority for the Mechanical Rubber Goods division of the rubber manufacturing industry are named as respondents in a F. T. C. complaint. The respondents are charged with entering into conspiracy to fix prices and with maintaining a boycott by refusing to supply their products to any wholesaler or retailer who failed or refused to quote or to sell at prices as fixed under the alleged agreement.

Montgomery Ward enters into a stipulation with the F. T. C. to cease from using word "Neatsfoot" so as no longer to deceive buyers into believing that products described as "Neatsfoot" are composed entirely of neatsfoot oil, when this is not true.

Unfair competition in the use of a fraudulent plan for the sale of a plastic paint and wall texture material called "Duralith" is prohibited in an order to cease and desist issued against Duralith Corp. of N. Y. City and Chicago, and William Weiner, chief executive officer.

Internal Revenue

Bureau of Internal Revenue places a new denaturing formula (S. D. 23-G.) in effect June 1 with the following formula:

Ethyl alcohol	100 gals.
Acetone U.S.P.	10 gals.
Sucrose octa-acetate	4¼ lbs. (avoir.)

Authority of Bureau Defined

Judge Welsh of the District Court of the U. S. for the Eastern District of Pennsylvania, in ex parte Harry L. Velenchik, No. M-561, upholds right of the Internal Revenue authorities to require the attendance and testimony of a person believed to have knowledge of matters required to be included in "returns," etc. relative to disposition of denatured alcohol, etc. Report is made by James P. McGovern, general counsel for The Industrial Alcohol Institute, 420 Lexington ave., N. Y. City. Copies are available.

Shellac

In the first few days of May shellac prices again turned downward as a result of further weakness in Calcutta and London. Some strength was noted earlier in April in the primary markets but this was rapidly dissipated in the face of light takings. As a net result, Bonedry declined to 19c in 10 barrel lots for prompt delivery. At the moment at least the advantage to the buyer is decidedly on the side of spot purchasing and contracts are unattractive. T. N. is down to 13½c and superfine down to 16c.

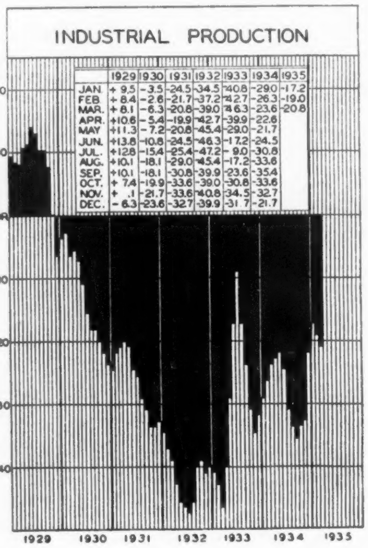
London and Calcutta quotations on Mar. 29 and Apr. 30 compare as follows:

	Mar. 29	Apr. 30
May	43s.	42s. 6d.
August	...	44s. 6d.
Calcutta (April-May)	10¼c	10¼c

Heavy Chemicals

¶New Freight Rates Bring Higher Prices—Consumption Somewhat Disappointing — New Lime Sulfur Schedule—

Chemical executives and buyers who had only an academic interest in the prolonged freight rate hearings before the I.C.C. became acutely aware of the significance of the partial victory of the carriers when actetate of lime was advanced 10c and acetic was "upped" from 5 to 18c according to strength. In the next few weeks there are more than likely to be a number of other upward revisions in schedules on items sold on a delivered basis and still others sold on an f.o.b. basis will cost more when freight bills are examined. A detailed list of the commodities affected was given in C. I., Apr., p. 353. The freight rates will be in effect until June 30th of next year.



Road back to normal is pictured by Cleveland Trusts' Business Bulletin

Movement of industrial chemicals into consuming channels was just a bit disappointing last month, the volume failing to reach the peak that was expected. Nevertheless, total consumption of chemicals was ahead of the same month last year and approximately equal to that reached in March. Uncertainty in the textile field was largely responsible for the failure of tonnages to make a new high for the current year. The threat of a strike in Akron rubber section was still another factor. Buyers as a natural consequence were more hesitant and purchasing while more frequent was generally in smaller quantities. On the other hand, alkalies moved out in better volume and chlorine and many of the seasonal items were more active. A slightly more conservative position was taken by buyers in the automotive centers although April production was close to 475,000 units and May is expected to be but slightly under this figure unless the strike of G. M. workers in Toledo continues and spreads to other cities.

Important Price Changes

ADVANCED

	Apr. 30	Mar. 31
Acid acetic, 28%	$2.45	$2.40
(all grades in proportion)		
Antimony, needle	.11	.10½
Calcium acetate	2.10	2.00
Glycerine, saponification	.10½	.10
Soaplye	.09½	.09
Sodium Antimoniate	.11½	.11
Sodium Stannate	.33	.31½
Tin oxide	.53	.51
Tin crystals	.38	.36½
Tin tetrachloride	.26	.24¾

DECLINED

None.

DEPT. OF LABOR STATISTICS

	Mar.'35	Feb.'35	Mar.'34
*Employment *a*	103.4	102.8	107.7
*Payrolls *a*	93.7	91.0	89.1
	Feb.'35	Jan.'35	Feb.'34
Prices *b*	86.5	84.5	78.8

	Mar. '35	Feb. '35
Exports, Industrial Chemicals†	$2,145	$1,758
Imports, Industrial Chemicals	1,620	1,143

a 1923-'25 = 100.0; * Index of chemicals alone; † 000 omitted; *b* 1926 = 100.0.

Glass producers were operating with expanded schedules over March when plate glass production totalled 16,531,950 sq. ft. as compared with 13,723,151 sq. ft. in February. Salt cake shipments are heavy both to the glass and paper industries.

April Price Movements

April price movements were almost entirely limited to upward revisions in tin salts and antimony compounds. These changes were due to stronger metal prices.

Sodium bifluoride and chlorate prices have been renewed for the 2nd quarter at unchanged levels. It is of more than passing interest to note that the "chemicals" weekly price index of the *Annalist* is below the figure of a year ago, being on Apr. 30 98.6, as compared with 99.6 on May 1, '34, while the monthly index was 98.6 as against 100.2 a year ago. This condition does not hold true, however, in the other generally accepted indices, that of the Dept. of Labor for example, being 88.1 on March 30 as against 79.0 for March, '34. It is below, nevertheless, the figure of 96.5 for March, '30.

Producers of lime sulfur solution have introduced a revised schedule as follows: Zone 1, jobbers, tanks 10c per gal. drums, 13½c to 15½c; dealers, tanks, 10½c; drums, 14c to 16½c; consumers, tanks, 11c; drums, 14½c to 17½c. Zone 1 includes Missouri, Iowa, Minnesota, Wis-

* Disodium and trisodium phosphates were raised 10c early in May.

consin, Illinois, Indiana, Kentucky, Tennessee, Ohio, Alabama, Mississippi, Louisiana, North and South Carolina; all New England states; upper tier of N. Y., eastern part of West Virginia and western Pennsylvania; Zone 2, jobbers, tanks, 10c; tank trucks, 10c; drums 11½c; dealers, tanks, 10½c; tank trucks, 10½c and drums, 12c; consumers, tanks, 11½c; tank trucks, 11½c and drums, 13c. Zone 2 includes territory in New York, west of Herkimer and east of Rochester; Zone 3, N. Y. State, west of Rochester, including Rochester, jobbers, tanks, 10c; tank trucks, 11c; 55-gallon drums, 12½c; dealers, tanks, 10½c; tank trucks, 11½c; drums, 13c; consumers, tanks, 11½c; tank trucks, 12½c and drums, 14c. Zone 4, which includes Hudson Valley area, northern New Jersey, jobbers or dealers, tanks, 10c; 50-gal. drums, car lots, 12½c; less car lots, 13c; half drums, car lots, 15c, and less car lots, 15½c.

Consensus of opinion in the trade points to slightly lower consumption in May in the textile centers and in the steel mills, in automobile and tire production, but slightly higher in the paper, glass, leather and paint fields.

20th Year

Rolls Chemical, Buffalo, celebrates 20 years in business with an extra issue of *Retorts*. Copies are available. See Booklets Section, p439.

Waxes

Demand in the wax markets appeared more encouraging in the past month. Various grades of Carnauba were advanced sharply in the middle of the month but some weakness developed at the close in the yellow grades, due to competition among the importers, and it was reported that current quotations on the yellow grades were temporarily under the replacement costs in the Brazilian market. Another "ship" story broke on the market towards the end of the month when news of the *Capillo* being ashore off the Coast of Brazil with a large consignment of various grades was announced. Upward revisions included higher prices for Japan and Spermaceti, both advances being caused by sudden better demand in the face of relatively small spot stocks in the N. Y. market. Primary Japan markets were very strong. On the other hand, Candililla was off ¼c to 10¾c when volume of buying declined sharply.

Important Price Changes

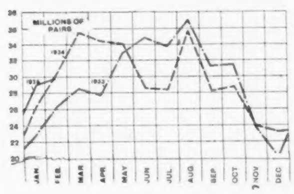
ADVANCED

	Apr. 30	Mar. 31
Beeswax, African	$0.23½	$0.23
Brazilian	.23½	.23
Carnauba, No. 1, Yellow	.39	.38½
No. 2, Yellow	.38	.37½
No 2, N. C.	.32	.31
No. 3, Chalky	.30	.27½
No. 3, N. C.	.31	.28½
Japan	0.07¼	0.07
Spermacati blocks	.22	.21
Cakes	.22	.21

Textile and Tanning Chemicals

¶*Tanners More Optimistic Meeting in N. Y.—Cotton Cloth Production Declines Still Lower—New Fall Colors Announced*

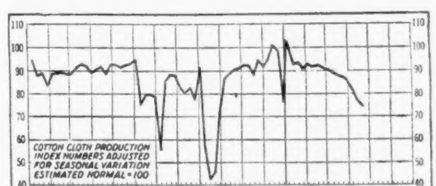
An encouraging expansion in the tanning field was reported late in April and movement of chemicals and specialties in this direction served to offset somewhat the losses in volume sustained by producers in the textile industry. Shoe production was off seasonally somewhat in the in-between-season, but further advances are expected shortly. Undoubtedly the meeting of the Tanners Council at which the Fall lines were displayed was the cause of the renewed activity, the show at the Waldorf in N. Y. City attracting the largest number of exhibitors and visitors in the history of the event. Rise in prices was an added incentive and tanners report that orders on the books are now somewhat ahead of a year ago on Fall leathers. Shoe producers are not looking any too kindly to the rise for they fear that they will not be able to pass it along. Considerable interest was attached to the action of the members of the Council in scoring much of the "New Deal" legislation now pending in Congress. A leather campaign, designed to increase the use and to combat other materials, was another feature of the meeting.



—Bureau of the Census
Shoe production totals are ahead of last year

The rises in egg albumen and egg yolk were, of course, a direct result in the sudden speculative spurt in silver. Prices now are largely nominal. Higher corn prices and increased freight rates were responsible for advances in corn starch, dextrin, and corn sugar. A number of prices were revised in the natural tanstuffs division.

Textiles present a puzzling picture. Cotton cloth production continues to decline at a very rapid rate as the accompanying chart clearly indicates. To add to the woes of the industry within the last few months importation of Japanese cloth is beginning to assume what has been termed "alarming proportions."* Silk, rayon and wool are more active and the situation in these groups is fairly stable and satisfactory. The April issue of the *Textile Organon* comments: The current peak of the general business and textile indices probably was reached in the January-February period. We anticipate an extra-seasonal decline from this point on into the summer, the extent of the decline being problematical, however."



—N. Y. Times

* Tariff Commission announces an investigation.

Important Price Changes

ADVANCED

	Apr. 30	Mar. 31
Albumen, egg	$ 0.90	$ 0.86
Corn sugar	3.56	3.46
Corn syrup, 42°	3.63	3.49
43°	3.68	3.54
Dextrin, corn	4.05	3.95
British gum	4.30	4.20
White	4.00	3.90
Egg yolk	.59	.56
Myrobalans, J1	24.50	23.50
Starch, corn	3.58	3.46
Powd.	3.68	3.56

DECLINED

None.

DEPT. OF LABOR STATISTICS

	Mar.'35	Feb.'35	Mar.'34
Textiles:			
Employment a	99.2	93.4	100.0
Payrolls a	86.8	84.5	82.6
Leather:			
Employment a	92.7	91.6	92.7
Payrolls a	84.1	82.5	84.4
Dyeing and Finishing Textiles:			
Employment a	116.9	117.8	117.2
Payrolls a	100.3	100.6	98.2

a 1923-'25 = 100.0.

Will Adjust Production

On recommendation of its Textile Planning Committee, the NRA on Mar. 26 authorized a Cotton Code order "to adjust available capacity in the cotton textile industry where it may be necessary to meet the present inadequate consumer demand." This order was issued to speed up the promulgation of a curtailment program if a committee composed of members appointed by the Cotton Code Authority plus one NRA member decides that an emergency exists in any division of the industry under the Cotton Code. The general order itself is merely to facilitate such procedure at some future date as noted.

Textile Shows

Textile chemical specialty supply houses with booths at the 31st Knitting Arts Exhibition, held in the Park Square Bldg. in Boston, during the week of Apr. 22-26 included: American Aniline & Extract with A. B. McCarty, T. P. Key, F. A. Carston, Jr., and H. H. Kirkpatrick present; Onyx Oil & Chemical, Jersey City, with J. W. Huber, E. A. Brick, L. P. Brick, Charles E. Maher, E. W. Klumph and C. D. Ehrengart in attendance; Sholler Bros., Philadelphia,

was represented by F. C. Scholler, L. M. Boyd, John F. Noble, Geo. Pickering and E. S. Atkinson.

Jacques Wolf & Co., Passaic, N. J., showed, in addition to its varied line of textile chemicals, a number of new introductions including Delustre S-342E, Dull Finish W-716 and Dull Finish W-8-F, which are freely suspended pastes and can be used on any type of hosiery. Waterproof W-559 which finds wide application for spotproofing, rainproofing, waterproofing, etc., was also prominently displayed. Those attending included Plant Superintendent Arnold Pfister, F. G. Henckel and G. J. Desmond.

Other chemical houses with booths included Quaker City Chemical, Chas. Cooper & Co., J. B. Ford Sales, Warwick Chemical and others. Attendance at the Exposition was more than satisfactory and the general consensus of opinion at the close was that this year's exhibits far surpassed any of the previous shows by a rather wide margin.

Earlier in the month the annual Southern Textile Exposition was held at Greenville, N. C. (week of Apr. 8). Textile chemical specialties were displayed by American Cyanamid & Chemical with P. F. Haddock, southern manager in charge, assisted by C. H. Suttle, Jr., Harry Rose and M. J. Wixson; E. F. Houghton & Co., Philadelphia; Keever Starch; Penick & Ford; Mathieson Alkali; Stein-Hall and Arnold Hoffman.

Defusing Tanning Technique

Under the new plan recently voted by the Laboratory Committee of the Tanners Council, informal meetings are to be held from time to time at tannery centers throughout the country at which Dr. Fred O'Flaherty, director of the Laboratory, will discuss with members the various objectives and details of the work currently being undertaken by the organization. First of these was held in Philadelphia on Apr. 26, in conjunction with a luncheon at the Bankers' Club.

Fall Shades are Ready

"Rustiques," a group of deep cloudy pastels and rich Autumn tones, represent an important fashion motif in the collection of 48 Fall woolen colors just released in new confidential brochure form by Textile Color Card Association to its members. "Crushed Pastels" provide a new and original theme in the collection of 56 Fall silk shades just issued.

Inaugurating a new service to its members in the glove industry, the Association is releasing advance swatches of the 9 Fall shades for women's gloves, applying to both leathers and fabrics.

Six new and 6 repeated shades for women's shoes have been chosen for Fall by the joint color committee of the allied shoe and leather industries in cooperation with the Association, and five new and one repeated color have been adopted for men's shoes by the joint committee of tanners, shoe manufacturers and retailers in collaboration with the Association.

Southern Textile Association

The 27th annual convention of the Southern Textile Association is to be held at the Ocean Forest Hotel, Myrtle Beach, S. C., June 14 and 15.

New Specialty House

F. A. Tomalino, well known in the dyeing field, forms Industrial Aniline & Chemical to manufacture textile chemicals, oils, finishes and specialties. Offices are located at Magnolia ave. and Armstrong lane in Germantown, Philadelphia.

Catalin Acquires "Prystal"

Of significance to the trade in general and particularly to the world of fashion which concerns itself with dress accessories, is the recent announcement by American Catalin of its purchase of the name and U. S. manufacturing rights covering "Prystal."

Labor Organizing

In a new attempt to organize New England finishing plant workers the Federation of Silk and Rayon Dyers and Printers of America will open a district division in Providence, R. I. The Paterson union is sending Frank Benti, its vice-president, to Rhode Island to take charge of the organization campaign in New England.

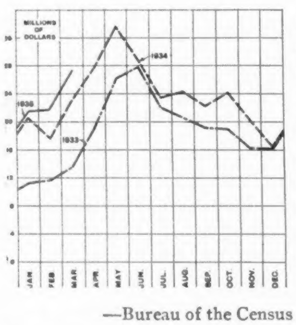
Paterson-Passaic Gossip

The things most talked about in the Paterson district last month included the efforts of the Independent Dyers Association to get the labor unions to see the wisdom of wage reductions in preference to abandonment of Jersey for the South and "Down East"; suit filed in the Federal Court in Newark by 8 Paterson silk dyeing concerns (Hydro, Gatti, Hamilton, Supreme, Radiance, Raytex and Vogue) questioning the constitutionality of NRA. Suit is direct against the Code Authority for the silk dyeing and printing industry. The Silk and Rayon Dyers' and Printers' Code Authority now located in the National Bank of America Bldg., Paterson, finds that the move leads to closer co-operation. The Independent Dyers Association has made a demand on the Passaic Valley Water Commission and Public Service for lower water and power rates. The code questionnaire sent out by the Silk Manufacturers' Association shows about 80% of the members of the opinion that NRA has not proved beneficial.

Paints, Lacquers and Varnish

¶Paint Business Improves — Building Figures Show Gains — Paint Exports are Larger — New Lacquered Can —

After a somewhat hesitant start movement of raw paint materials and chemicals reached encouraging seasonal proportions in the last half of the past month. Paint sales were slow in the first 15 days due to cold and wet weather but were greatly stimulated by the warm, dry week that closed the month. As a result of this spell of rainy days in the first half of the month May and June sales are expected to be benefited by the delayed purchasing.



—Bureau of the Census

Paint, lacquer and varnish sales are showing more than seasonal gains

With pig lead higher ($1.00 a ton), upward revisions in red lead, litharge and orange mineral were immediately placed in effect. A highly competitive situation has "broken out" in chrome green. The sudden wide advance in the price of silver and other exchange rate changes forced a number of revisions in varnish gums. Casein prices were off from the March closing figures. Many of the raw materials used by the paint field are affected by the upward revision in freight rates but up to the end of the month no price advances were announced on items that are usually sold on a delivered basis. Other important changes of the month included higher prices for French yellow ochres and lower quotations for both red and yellow mercuric oxide. Both sellers

Important Price Changes

ADVANCED

	Apr. 30	Mar. 31
Litharge	$0.0525	$0.0515
Orange mineral	.09¼	.09
Red lead, 95%	.0625	.0615
97%	.0650	.0640
98%	.0675	.0665
Yellow ochres (various grades, ¼ - ½c)		

DECLINED

Casein, 20-30	$0.12¼	$0.12½
80-100	.12¾	.13
Chrome Green	.17	.20
Mercuric Oxides	1.09	1.06

DEPT. OF LABOR STATISTICS

	Mar.'35	Feb.'35	Mar.'34
Employment a	104.2	102.2	98.4
Payrolls a	86.2	83.7	77.1

	Feb.'35	Jan.'35	Feb.'34
Prices*	78.8	79.0	79.3
Exports†	$1,472	$1,137	

a 1923-'25 = 100.0; † 000 omitted; * 1926 = 0.

of raw paint materials and paint manufacturers anticipate further expansion in the next 60 day period. Lacquer manufacturers while still extremely busy look for some decline in the automotive and other industrial consuming industries.

March construction figures show encouraging and more than seasonal advances, according to the Bureau of Labor Statistics, the value of the buildings for which permits were issued in the principal cities of the country indicating an increase of 53.5%.

March Sales Expand

Paint, varnish and lacquer sales for March, as reported by the Bureau of the Census (586 establishments, representing 80.1% of the total value of products), are reported at $27,332,504, compared with $23,125,119 in '34 and $13,578,568 in March of '33. Totals for the first quarter: '35, $70,749,836; '34, $61,409,630; '33, $36,519,698. Industrial sales for the first quarter were $22,500,219, made up of $15,625,028 for paint and varnish, and $6,875,191 for lacquer. This compares with $18,759,619 in the first quarter a year ago, with the paint-varnish sales amounting to $12,773,915 and lacquer, $5,985,704.

F. H. A. Helps

Accelerated by the better housing program of the Federal Housing Administration, modernization and repair and new construction are proceeding at an encouraging pace. On April 19, pledges for modernization and repair obtained by the canvasses active in numerous communities had reached $351,274,822. Total funds that had been advanced under the Modernization Credit Plan on the same date amounted to $56,507,871. Individual credit advances by April 19 numbered 134,794.

March awards for residential building construction almost doubled the volume reported in February according to F. W. Dodge Corp. At the same time, residential total exceeded the March, '34 volume by almost 15%; in fact March, '35 contract volume for this class of construction, Dodge organization reports, was the highest recorded since March, '32, when the total for 37 eastern states was only one million dollars greater than the volume of $32,207,400 reported for last month.

For the first quarter of '35, total awards amounted to $297,864,500 in the 37 eastern states as against $461,525,800 for the corresponding quarter of '34. In this connection it should be recalled that a year ago the PWA program was approximately at its height.

43% Improvement in Exports

Exports of paint products and naval stores were well maintained in March, former advancing 43% to a total of $1,471,860, and the latter 8% to $1,364,770, compared with March of last year. Most items also registered substantial gains in quantity, shipments of carbon black in March were more than double those for March, '34, and ready mixed paints, stains and enamels, increased approximately 50%. Rosin exports advanced only slightly but turpentine which has suffered from weak foreign demand in recent months advanced 35% in quantity to 969,400 gals., and 24% in value to $478,300, compared with March last year.

A lacquer inside the can (American Can) makes "canned" beer commercially feasible

Back to Washington

Second annual meeting of the N. P. V. & L. A. (48th meeting of the organized paint, varnish and allied products industry) is again scheduled for the Mayflower in Washington, Oct. 30 and Nov. 1.

"Clean Up" Campaigns

Chicago's popular mayor will open the Chicago "Clean Up and Paint Up" campaign. Over 600,000 school children are enlisted in the drive. Pittsburgh's mayor receives for the city the annual trophy awarded by the Bureau for the best campaign in Pennsylvania in '34.

Fine Chemicals

¶Speculation On Silver Drives Prices of Salts Higher — New Mercury Sales Agent—

The outstanding event, of course, in the fine chemical markets last month was the detailed revision of all silver salts upward to compensate for the sudden speculative advance in the metal. The sharp rise left the producers of silver nitrate and other silver salts with no alternative but increasing the quotations.

Call for seasonal items was somewhat disappointing. Movement of citric and tartaric acids into consuming channels was affected by the cold weather prevailing in most sections. Lactic, on the other hand, was in specially good demand. Mercurials, generally, are steady, reflecting stability in quicksilver. According to reports, production of mercury is not heavy and the statistical picture is said to be better. This has not been able to prevent weaknesses in the yellow and red oxides, in calomel, nor corrosive sublimate, but this condition is caused by keen competition among the producers and not by any weakness in the metal. Calcium lactate was down 5c early in the month as producers sought business keenly. Alcohol prices are reported firm at the recently advanced quotations.

In some quarters heavier purchasing of raw materials from abroad has been quietly taking place. Fear of further inflation, plus the uncertainties in Europe, plus the possibility of further upsetting revisions in currency exchange in both Europe and the Orient are some of the reasons assigned for such action.

April volume was up to that of March, in fact it was slightly better. Compared with April a year ago it was decidedly better. Demand for items seasonally active in the cold weather will decline, of course, but the call for citric, tartaric and other commodities is expected to hold May volume up to a fairly active level. In many quarters the advance in crude glycerine was looked upon as an indication that C. P. would shortly be quoted higher. Cadmium metal was up 10c but the salts were still unaffected.

Important Price Changes

ADVANCED	Apr. 30	Mar. 31
Brucine Alkaloid	$0.16	$0.12
Brucine Sulfate	.12	.08
Cadmium, metal	.65	.55
Silver Nitrate	.53¾	.42¼

DECLINED		
Acetophenone	$1.40	$1.45
Calcium Lactate	.30	.35
Cinnamic Aldehyde	1.65	1.70
Collodion, U.S.P.	.12	.13
Flexible	.14	.15
Iron Reduced	.60	.70
Mercury Oxide, U.S.P.	1.51	1.59
Phenylacetaldehyde	4.80	4.85
Sodium Perborate	.17	.18

DEPT. OF LABOR STATISTICS	Feb.'35	Jan.'35	Feb.'34
Prices, Drugs and Pharm.*	73.1	73.1	71.5

* 1926 = 100.0.

New Quicksilver Factor

Verde Quicksilver Sales Co. is formed by John H. Hall, Jr., and John H. Schults, both formerly of United Verde Copper, to take over the quicksilver business formerly conducted by the copper company. Offices are at 1 Wall st., and the telephone, Bowling Green, 9-9000.

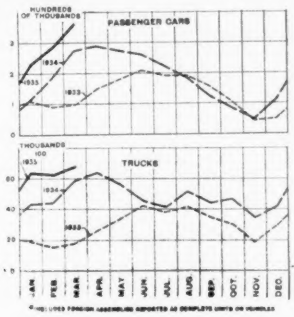
Spanish Trade Agreement

Domestic producers of mercury expect that in any reciprocal trade agreement with Spain that the U. S. negotiators will protect the small but essential U. S. production to the extent at least of not offering to lower the import rate. It is thought unlikely that any increase could be obtained.

Coal Tar Chemicals

¶Most Solvents Scarce as Automotive Production Continues Heavy — March Coking Greater than February—March Dye Imports—

April coaltar chemicals market was almost a duplicate of that of the previous month, demand for toluol, solvent naphtha and xylol continuing at a high rate, benzol irregular, crescylic acid active but competitive in price, naphthalene demand slower than usual at this time of the year, and dyes and intermediates less active because of curtailment in textiles. No important price revisions were made during the month.



—Bureau of the Census
Manufacturers sales continue to indicate a "boom" year in the automotive industry

With 480,000 units made in the automotive centers in April there is little wonder that the scarcity of toluol, xylol and solvent naphtha remained unchecked. May production is now expected to reach close to 400,000 unless checked by an industry-wide strike movement. There is plenty of room for agreement with the general feeling in the Detroit area that 2nd quarter production will go over a million by a rather wide margin, and the more optimistic are now anticipating a total production for the year of over 4 million.

First quarter production of automotive units is reported by Brookmire at 1,109,591 against 749,532 for the first quarter of '34, a gain of 48%. This statistical organization places probable '35 production at 3,724,600, divided by months as follows: April, 455,000; May, 427,700; June, 308,200; July, 249,500; August, 228,300; September, 229,000; October, 204,600; November, 212,200; December, 300,600.

Manufacturers of intermediates and dyestuffs are holding down manufacturing operations pending some indication of a return to more normal conditions in textiles. What was expected to be a good year (according to the 2-year cycle theory) is failing to materialize as May is reached, and the immediate outlook is very unsatisfactory. Dye demand from other industries is holding up well and producers point to the nearness of the fall season manufacturing operations as an encouraging note.

Important Price Changes

ADVANCED

	Apr. 30	Mar. 31
None.		

DECLINED

None.

DEPT. OF LABOR STATISTICS

	Mar. '35	Feb. '35
Exports†	$1,347	$ 854
Imports†	1,005	1,392

† 000 omitted.

High Rate of Activity

Average daily rate of coke production during March declined 5.2% in comparison with the February rate, although tonnage, based on a 31-day month, registered an increase. With the exception of February, however, March rate of 97,813 tons was the highest since June, '34. Total tonnage for the first quarter of '35 amounted to 8,775,676 tons, an increase of 5.3% over the corresponding period of '34. Production of pig iron for the same period increased 18.7%.

Output of byproduct coke for March was 2,911,292 tons, or 93,913 tons per day. Compared with February, average daily production decreased 5.4%, borne mostly by the furnace plants, where the rate was 7.5% less than that of the preceding month. At merchant plants rate declined only 1.1%. Beehive coke production made a further slight advance during the month, the total tonnage amounting to 101,400 tons, an increase of 9.3% when compared with the production during February.

Stocks at byproduct plants rose from 2,860,186 tons to 2,960,823 tons, or 3.5%. Increase was entirely at merchant plants, where stocks advanced 11.4%. Reserves at furnace plants were decreased by 5.1%.

March Dye Imports Decline

U. S. March synthetic dye imports showed a decline from the preceding month of 29,058 lbs. in quantity, and a decrease in value of $80,436, total figure for March being 313,940 lbs., against 342,998 in February, with a value of $433,144, against $513,580. March imports of this year showed a gain of more than 6% over the volume of the same month a year ago, and a 4% value gain.

March imports of synthetic aromatic chemicals increased above those of the preceding month by 119%, and gained in value by more than 3%. Total pounds were 20% below that for the same month a year ago, and the value more than 3% above.

SYNTHETIC DYES IMPORTS

	1935		1934	
	Pounds	Value	Pounds	Value
Jan. ...	437,595	$691,309	232,078	$349,504
Feb. ...	342,998	513,580	335,349	472,167
Mar. ..	313,940	433,144	293,674	416,387
Totals	1,094,533	$1,638,033	861,101	$1,238,058

Chemical Specialties

¶New N. Y. Poisons Label Law—White Resigns from Code Authority—Monsanto's Disinfectant Reinforcing Agent—

A poisons label is now required (effective Sept. 1) on a number of chemicals in a new N. Y. State law where they are sold for household use. Act provides that all dangerous caustic or corrosive substances in parcels, packages, or containers, must be branded with the word "Poison," running parallel with the main body of reading matter on the label or sticker, on a clear background of a distinctly contrasting color, in uncondensed Gothic capital letters of not less than 24 point size.

The "dangerous caustic or corrosive substance" means hydrochloric, sulfuric and nitric acids, phenol, oxalic and acetic acids, bleaching powder, caustic potash, caustic soda and lye, silver nitrate and ammonia water.

"Greatest Fiasco"

Branding NRA the greatest fiasco, from a business man's viewpoint that he had ever indulged in, Dr. Robert C. White, of the Robert C. White Co., Philadelphia, resigns as chairman of the Code Authority for the insecticide and disinfectant manufacturing code. Three others on the Authority have also resigned.

Monsanto's "Santophen"

Monsanto is introducing "Santophen" a powerful and economical reinforcing agent in coaltar disinfectants. Three different types are offered and complete technical data are available from the St. Louis main office.

"Silver Dust" in Chicago

Gold Dust Corp. launches a sampling campaign in Chicago for "Silver Dust," a white soap for dishes and laundry. An 8-ounce sample will be given to all Chicago housewives who respond to calls of uniformed carriers.

Housewife will also be offered, free, a dish towel worth 25c, with the purchase of 2 packages of Silver Dust at the grocery. Similar merchandising plan was successfully used in the N. Y. area.

Month's Outstanding Product

With a record of winning 80% distribution in the Newark market within 5 days, according to *Advertising Age*, Nu

---

Fome Corp., marketing a new cleaning fluid, expects to expand its efforts toward national distribution in the fall.

Nu Fome is a non-inflammable, non-explosive cleaner. An 8-ounce can, selling at 65c, makes a gallon of fluid. It is recommended for cleaning clothes, furniture, drapes, walls, woodwork, and automobiles, among other uses.

P. & G. Denied "Chipso"

P. & G. loses "Chipso" as a trademark for soap chips in a decision of the U. S. Court of Customs and Patents Appeals on Apr. 30, the Court holding that "Chase-O" trademark of the J. L. Prescott Co. registered in '13 had a prior right and that the 2 might be confused. P. & G. claimed unreasonable delay in asking for the cancellation and also that the Prescott Co. had changed the size and style of package.

Solvents

Several price revisions were placed in effect on petroleum solvents in the first week of May. On the Coast a 1c advance was made in lacquer diluents, petroleum thinners, and V.M. & P. naphthas. Tankwagon and drum prices for petroleum thinners in the five Boroughs of N. Y. City were advanced with the rate at 13c with 2c off for large accounts and an additional ½c for 20,000 gal. contracts. Sale of Stoddard was slow in that area following a serious strike, in 100 plants of the dyers and cleaners. Tankwagon delivery of thinners is now quoted at 11c in the Boston area. Adjustments were made in Baltimore and Albany also.

Elsewhere the market remained firm and unchanged. For a time early in the month there was some talk of a possible rise in the mid-west quotations, but this ended rather abruptly when the strengthening in prices failed to continue.

Shipments of lacquer solvents continued in good volume during April, and the outlook for May is satisfactory although some let-up is anticipated in production figures. Shipments of solvents to the rubber centers were interrupted somewhat in the early part of the month when the possibility of a serious strike loomed up. With the labor situation cleared, shipping orders again were received in larger quantities by producers.

Important Price Changes

ADVANCED

Apr. 30 Mar. 31

Pacific Coast, 1c advance in Petroleum Solvents.

DECLINED

None.

DEPT. OF LABOR STATISTICS

	Mar.'35	Feb.'35	Mar.'34
Petroleum:			
Ref. employ. a	107.9	107.3	110.2
Ref. payrolls a	96.4	95.3	92.0

a 1923-'25 = 100.0.

Naval Stores

Naval stores markets in the first month of the new year was one largely devoted to marking time. Would a new loan for '35 be available? While the overwhelming majority felt that it was a certainty, there was comparatively little trading pending a final announcement. Movement, therefore, in prices was within very narrow limits. Generally speaking, the middle grades were stronger and the lower and higher slightly under the closing March market.

SAVANNAH

	March 30	April 30	Net Change
B	$3.50	$3.40	—$0.10
D	3.80	3.75–80	— 0.05
E	4.00	3.90–4.05	— 0.10
F	4.25	4.35–37½	+ 0.10
G	4.35	4.45	+ 0.10
H	4.35	4.45–47½	+ 0.10
I	4.35	4.45–47½	+ 0.10
K	4.35	4.45–50	+ 0.10
M	4.35–40	4.50–55	+ 0.15
N	4.95–5.00	4.85–90	— 0.10
WG	5.50	5.15–25	— 0.35
WW	6.25	6.10	— 0.15
X	6.30	6.15	— 0.15
Turpentine ..	47¼–47½c	47¼c	......

In the same period FF wood rosin lost 5c, and was quoted at $4.35 at Southern shipping points.

Loans Available

New loans to those producers of gum turpentine and gum rosin who are signatory to the marketing agreement for the industry were authorized Apr. 26 by the Commodity Credit Corp. upon recommendation of A. A. A., thus setting at rest the uncertainty that has plagued the naval stores markets.

A commitment of $7,000,000 has been made by the Reconstruction Finance Corp. to the C. C. C. for the purpose of making such loans.

New loans will mature Mar. 31, '36. They will be made on the basis of $50 per unit (a unit consists of one 50 gal. barrel of turpentine and 3⅓ 500-lb. barrels of rosin).

'35-'36 Quota Fixed

Limitation on sales of gum naval stores by the Dept. of Agriculture for the new year (beginning Apr. 1) is 450,000 bbls. of turpentine and 1,500,000 bbls. of rosin.

Oils and Fats

The rise and subsequent partial decline in silver of the past month was largely responsible for a number of sharp advances and then losses in many of the leading oils. In many cases quotations became largely nominal. The result of the price movements, however, was a net decline for the month. The oils and fats index of the National Fertilizer Association declined from 79.5 on Mar. 27 to 78.2 on Apr. 27, and compares with 50.2 on Apr. 27 of last year. Buying was largely held to spot business in the oils last month with purchasers unwilling in most instances to gamble on the future course of the market. The feature of the vegetable oil market was the continued rise in Chinawood. Spot oil is said to be scarce and drums were quoted locally at 17-18c while tanks for July delivery were quoted at 14½c. Users of tung oil were interested in the tankcar shipped recently from Mississippi. The first tankcar for the season was also reported from the Gainesville, Fla., plant.

Oils and fats price index, Bureau of Raw Materials for American Vegetable Oils and Fats Industries, decreased from 114.5 in March to 108.2 in April. It was 73.0 in April a year ago.

Cottonseed Trading

Trading in cottonseed oil futures on the N. Y. Produce Exchange totaled 1,009,350 bbls. for the first quarter of '35, comparing with 448,200 bbls. a year ago and a turnover of 2,991,000 for the whole of '34, which was the largest year since '28.

Many of the speculative interests in cottonseed oil shifted attention to the silver market last month, with the result that a quieter market prevailed. A comparison of end-of-the-month closing quotations follows:

	Mar. 29	Apr. 30
April	10.20–45	10.35–50
May	10.26–30	10.40–65
June	10.28–42	10.60–62
July	10.44	10.56–72
Aug.	10.38–48	10.63–66
Sept.	10.45	10.50–52
Oct.	10.11	10.45–60
Nov.	10.05–20	10.45–60
Crude, Southeast	9.50	9.25*
Valley	9.50	9.25*
Texas	9.50	9.25*

* Nominal.

Linseed Oil Demand Poor

Linseed oil demand remained very light during April. Prices remained unchanged from the levels quoted on Mar. 30. Higher quotations, however, were posted for both meal and cake. Flaxseed prices remained steady during the month as the following comparison of end-of-the-month quotations indicates:

	March 29		April 30	
	May	July	May	July
Minneapolis	$1.74	$1.76	$1.73¾	$1.74¾
Duluth	$1.74¼	$1.74¼	$1.79	$1.77½

At this early date the weather conditions in the flax sections have been satisfactory.

Briefly Summarized

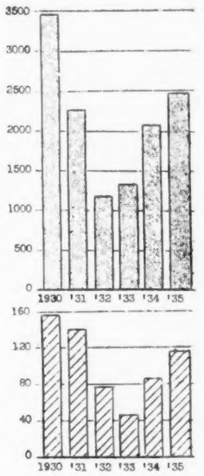
First tankcar shipment of tung oil for this season left Alachua Tung Oil's Tioga, Fla., plant on Apr. 14, consigned to the parent company, Benjamin Moore, Carteret, N. J.

A. R. Lange, Swan-Finch technical director, succeeds Munson Burton who has retired. He will direct fish and mixed oil departments.

Fertilizers

¶*Potash Prices Remain in Doubt —April Raw Material Tonnages Small—Tag Sales Encouraging*

"What about next year's potash prices?" This is the most discussed subject in the fertilizer materials group. With the expiration of the schedule on May 1 suppliers were taking what little business there was on a provisional basis calling for adjustments when the schedule is finally released. According to reports, the Spanish producers are definitely in the cartel and the Russian producers are either in or are ready to cooperate. Providing these rumors are true, it would seem more than likely that a strengthening of the price structure is imminent. In most quarters it is expected that most grades will again be quoted at last season's levels, possibly a few higher, but certainly much of the weakness of the past year will be eliminated. It is rumored about that a meeting of international potash interests was held in N. Y. City in the first week of May, but this could not be confirmed, nor could the rumor that Spanish potash will be handled by the representative of the Franco-German syndicate.*



Fertilizer tag sales compared. Top, southern states, below, northern group

Tonnages of fertilizer materials were relatively small in April. This is a seasonal trend. Most of the mixing is usually over and the top-dressing season does not occur until later. The decline of the last few months in the organic ammoniates was extended into April, and the opinion is freely expressed that this downward movement will extend further in the next 60 days. Both imported and domestic fish meals developed strength in the past month although buying was light. Buyers are evincing much interest in the bills before Congress which would tax imported scrap. Rate is variously expressed, one measure as high as $20 a ton while another calls for $12.50. Movement of sulfate and nitrate was slow.

Purchasing and application of mixed fertilizers by consumers was seriously curtailed in the first weeks of the month by cold wet weather but some improvement was reported later. Despite this late start mixers generally are of the opinion that the total will exceed last year's figure. So far as the plant food industry is concerned, it is enjoying the best year in 4 years past, both in the matter of volume and prices. For instance, tag sales in the 10 cotton states for this season to date aggregate 2,276,743 tons, which is a 12% increase over the same period a year ago, and 90% improvement over 2 seasons ago.

* Foreign report states Spanish producers will receive 14-16% quota in the Syndicate. On May 11 prices were announced—Muriate, 40c, Manure Salts, 43c, Kainit, 50c, representing a rise in low grade salts and lower prices for sulfate and magnesia sulfate. Seasonal discounts are also discontinued.

Important Price Changes

ADVANCED	Apr. 30	Mar. 31
None.		
DECLINED		
Blood, dom., N. Y.	$ 3.20	$ 3.25
Chgo., high-grade	2.75	3.25
Imp., May	2.80	2.90
Castor Pomace	17.50	18.00
Dicalcium Phosphate	.77	.80
Nitrogenous mat., imp.	2.40	2.45
Eastern	2.40	nominal
Western	2.00	2.15
Tankage, grd., N. Y.	2.60	2.65
Chgo.	2.40	2.50
Tankage, imp.	2.75	3.00

DEPT. OF LABOR STATISTICS	Mar.'35	Feb.'35	Mar.'34
Employment a	167.5	120.3	160.4
Payrolls a	130.4	91.1	107.3
	Feb.'35	Jan.'35	Feb.'34
Prices, Fert. Mat.*	66.2	66.5	69.2
Mixed Fert.*	72.8	73.3	72.5
Exports†	$ 816	$ 865	
Imports†	3,433	2,950	

a 1923-'25 = 100.0; † 000 omitted; * 1926 = 100.0.

The indices of the N.F.A. show very little change in the past month. A comparison with the same period of last year is also shown:

	Apr. 27	A month ago	Yr. ago
Mixed Fertilizer	76.0	76.1	76.1
Fertilizer Materials	65.3	65.2	66.7

March Sales 15% Higher

March fertilizer tag sales were 15% ahead of last March in the South and 21% larger in the midwest. Sales in the Southern states were equivalent to 1,414,925 tons, largest tonnage reported in the N. F. A. compilation since March, '30. Increase over March last year was 180,482 tons or 15%.

Fertilizer Company News

A first prize of $100 and 36 other prizes are offered by Wilson & George Meyer & Co., San Francisco, importer of calcium nitrate, for letters telling of experiences of growers with this material.

Atlantic Fertilizer, Savannah, loses the Blue Eagle for an alleged code violation.

J. R. Colemen is out of Swainsboro Fertilizer, Swainsboro, Ga., and will erect his own mixing plant. He is also prominent in naval stores.

Barrett is now showing its educational film "Back to the Soil."

Nitrate Manual

A highly valuable reference is Barrett's new booklet, with a discussion of nitrate in industries by Williams Haynes, publisher, CHEMICAL INDUSTRIES, a valuable nitrogen chart and 3 other outstanding contributions by experts on nitrate. Use coupon on page 439, asking for A 142.

Gums

Meteoric advances in the silver market last month caused several price advances in the natural resins and generally added confusion and uncertainty to both the local and primary markets. As a result, buyers are even more cautious about future contracts and are holding aloof from the market except for small replacement needs. Batavia dammars were for a time proportionally higher than the Singapore gums. To correct this the Batavias D, A/E were advanced ½c and A/D ⅜c late in the month. At the same time Singapore No. 3 was advanced ¼c. In the previous week No. 2 was reduced ½c to the basis of 10⅝c, and in the first week of the month No. 1 was offered at a ⅜c reduction, while the dust was weaker by a ¼c. In the middle of the month several of the Batavias were revised upward as follows: A, 21⅛c, up 2⅛c; B, 20⅛c, up 2⅛c; C, 18c, up 2c; D, 13c, up ¾c; A/D, 14¾c, up ⅝c; A/E, 13c, up 1c; E seeds, 7⅛c; up ⅜c; dust, 6⅛c, up ⅝c; and F, 6⅛c, up ¼c. At the same time a number of the Copal Congo grades were reduced.

Important Price Changes

ADVANCED	Apr. 30	Mar. 31
Dammar, Batavia, D	$0.13½	$0.13
A/D	.15½	.14¼
Singapore, 3	.04⅞	.04⅝
Manila, Loba B	.10¾	.10¼
Mastic	.55	.52
DECLINED		
Benzoin Sumatra	$0.22	$0.24
Camphor, Slabs, powd.	.49	.50
Dammar, Batavia, Singapore, No. 1	.15⅝	.16
No. 2	.10⅝	.11⅛
Hiroe Macassar, bold	.09⅞	.10½

Manila Loba C was off ½c and Loba DBB and Loba DU were quoted ⅜c under previous quotations. Elemi, on the other hand, had 2 advances last month, one of 1⅝c and another of ⅜c and is now quoted at 11¾c in carlots. The past 30 days have seen more price revisions than have been made for many months, and this leaves buyers in an unsettled frame of mind as to the future course of the market.

Procter, Chicago Gum Factor

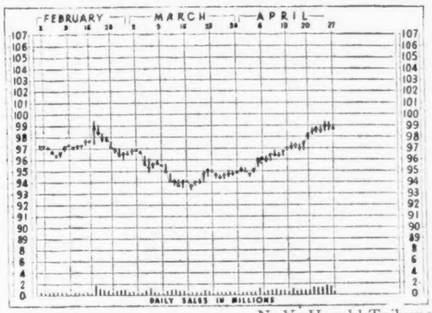
Thomas W. Procter is now Chicago representative for France, Campbell & Darling, Brooklyn importer and dealer in varnish gums.

Chemical Finances

¶First Rise in Values Since the First of the Year—Chemical Stocks Advance in General Rally—Additional Earnings Statements—

After 3 months of declining markets stocks listed on the N. Y. Stock Exchange gained $2,612,247,946 in value during April. Volume of trading rose too, bringing in its wake a more optimistic note in the financial centers.

Daily Record of Stock Market Trend



—N. Y. Herald-Tribune

On May 1 there were 1,182 issues listed, aggregating 1,301,900,490 shares, with a total market value of $33,548,348,437. This compared with 1,184 issues listed on April 1, aggregating 1,303,680,865 shares and having a market value of $30,936,-100,491.

Chemical Values Increase

In the chemical group a number of the more prominent common stocks registered sharp gains. The group as a whole increased in value from $3,760,788,776, with an average price of $50.78 on April 1 to $4,022,709,791, with an average price of $54.31 on May 1, a net gain of $261,921,-015 in dollars and $3.53 in the average price. On Jan. 1 the value of the chemical group was reported at $3,895,016,123 with an average price of $52.10 so that on the last day of April chemical stocks were at a higher level than at the beginning of the year. This was not true of the market as a whole for the total value of all listings was still $385,534,177 below the first of the year figure.

It is rather difficult to assign any given set of reasons for the turn from the downward trend, although undoubtedly the sudden speculative craze in silver, fairly satisfactory quarterly earnings statements from a large number of important companies, plus continued high rate of activity in the automotive and a few other industries helped considerably in putting the financial community in a better frame of mind. In addition, a reaction from the continued pessimistic viewpoint of investors brought out some delayed investment buying and, incidently, the chemical stocks are strongly appealing to many in this class. Finally the passage of the Emergency Relief Appropriations Act with nearly 5 billions of dollars to be spent is looked upon by business men as likely to stimulate trade for an indefinite period, even though they disapprove of it because of the fear of its long-time results.

Allied Stockholders Meet

At the annual meeting of stockholders of Allied Chemical, H. F. Atherton, president, stated that directors had come to no decision on the permanent registration of the stock with the SEC and that no registration statement had yet been filed. Very careful consideration is being given the matter by the board, and it is expected that a decision will shortly be reached.

Representatives of the Nichols interests and Solvay Investment refrained from voting their stock for directors and requested that a note be made on the minutes.

Stock Offering

One of the first offerings of common stock under the Securities Exchange Act to finance an industrial concern will be made by Glidden, it became known recently when Adrian D. Joyce, president, confirmed reports that the company was filing with the Securities and Exchange Commission an application for registration of additional common stock.

Earnings Statements

Du Pont issued late in the month details of its report of earnings for the quarter ended on Mar. 31. It showed a net profit of $11,097,142, which was equivalent, after dividends on the debenture stock, to 85c a share on the 11,048,507 average number of shares of common stock outstanding. This compared with $11,628,-154, or 90c a share on 11,062,168 shares, in the first quarter of last year. Figures for each year include dividends from the G. M. amounting to 22½c a share on the du Pont stock. In the 4th quarter of last year, earnings were 56c a share on the du Pont stock including G. M.'s 22½c.

In accordance with its custom, the du Pont Co. adopted the value of its 10,000,000 shares of General Motors to $162,000,000, or at $16.20 a share last month, against $15.70 in the previous valuation. This closely corresponded to the net asset value shown by the balance sheet of General Motors for Dec. 31, '34.

Commercial Solvents

Commercial solvents reports for the quarter a net profit of $564,860, after depreciation, interest, Federal taxes and other charges, equal to 21c a share on 2,636,110 no-par shares of common stock, against $635,004, or 24c a share, in the same period last year.

Westvaco Chlorine

Report of Westvaco Chlorine Products and subsidiaries for the quarter shows net profit of $162,233 after depreciation, federal taxes, etc., equivalent after dividend requirements on 7% preferred stock, to 43c a share on 284,962 no-par shares of

Dividends and Dates

Name	*Div.*	*Stock Record*	*Payable*
Allied Chem. & Dye	$1.50	Apr. 9	May 1
Amer. Smelt., 2nd pf. ac.	$4.50	May 10	June 1
Amer. Smelt., 1st pf.	$1.75	May 10	June 1
Archer-Daniels-Midland, pf.	$1.75	Apr. 20	May 1
Atlas Powder, pf.	$1.50	Apr. 19	May 1
Bon Ami, Class A	$1.00	Apr. 15	Apr. 30
Colgate-Palmolive-Peet	12½c	May 6	June 1
Consol. Chem. Indust., pf.	37½c	Apr. 15	May 1
Dow Chemical	50c	May 1	May 15
Dow Chemical, pf.	$1.75	May 1	May 15
Hercules Powder, pf.	$1.75	May 3	May 15
Imp. Chem. Ind., ADR	5½%	Apr. 12	June 8
Imp. Chem. Ind., def'd	2%	......	......
Liquid Carbonic	25c	Apr. 16	May 1
Monsanto Chemical	25c	May 25	June 15
National Carbon, pf.	$2.00	Apr. 20	May 1
National Lead, pf. A	$1.75	May 31	June 15
National Lead, pf. B	$1.50	Apr. 19	May 1
N. J. Zinc	50c	Apr. 20	May 10
Procter & Gamble	37½c	Apr. 25	May 15
Sherwin-Williams	75c	Apr. 30	May 15
Sherwin-Williams, pf.	$1.50	May 15	June 1
Smith Agr. Chem.	12½c	Apr. 20	May 1
Smith Agr. Chem., 6%	$1.50	Apr. 20	May 1
Solvay Amer. Invest, pf.	$1.37½	Apr. 15	May 15
Sterling Products	95c	May 15	June 1

ANNUAL MEETINGS

	Record Date	*Date of Meeting*
Solvay Am. Invest.	Apr. 25	May 15

Price Trend of Chemical Company Stocks

	Mar. 30*	Apr. 5	Apr. 12	Apr. 18	Apr. 26	Apr. 30	Net gain or loss past month	Price on Apr. 30, 1934	1935 High	1935 Low
Air Reduction	110½	112⅝	114	114½	118⅞	120	+ 9½	99⅜	120	104⅜
Allied Chemical	131¾	134⅜	133	139	145	144	+12¼	144	146	125
Columbian Carbon	73½	74	73⅞	74⅝	79	77	+ 3½	70	80¼	67
Com. Solvents	19¼	19⅛	19¾	19½	20¼	19¼	......	25¾	23⅞	17⅝
du Pont	89½	90⅝	92⅛	94⅜	97⅛	96¾	+ 7¼	92	99½	86⅝
Hercules Powder	71	.....	73½	76	73	75	+ 4	71	77⅝	71
Mathieson	26	27¼	27⅜	27	28⅛	28	+ 2	33½	32	23¾
Monsanto	59	59⅜	59¾	61	67¼	66½	+ 7½	46	67¾	55
Std. of N. J.	37	38¾	40	40⅝	42¼	43	+ 6	44⅝	43½	35¾
Texas Gulf S.	30	29¾	31	31⅛	31⅝	30⅞	+ ⅞	34⅞	36¾	28¾
Union Carbide	46⅛	47⅛	48¾	50	51⅝	51½	+ 5⅜	42½	52⅞	44
U. S. I.	38¼	38½	38½	40	42½	41½	+ 3	50⅝	45½	36⅛

* Last day of the month.

common stock. This compares with $160,-314 or 42c a share on common in March quarter of previous year.

Current assets as of Mar. 31, last, including $492,595 cash and government securities, amounted to $1,849,655 and current liabilities were $392,811. This compares with cash and government securities of $462,650, current assets of $1,448,-526 and current liabilities of $331,375 on Mar. 31, '34.

Texas Gulf Sulphur

Texas Gulf Sulphur reports for the quarter a net income after depreciation, amortization and other charges but before depletion of $1,540,869, equal to approximately 40c a share on 3,840,000 no par capital shares, against $1,427,778 or 56c a share on 2,540,000 shares a year before. Current assets, including cash and U. S. Government Treasury notes and certificates of $9,212,640, amounted to $11,145,411, and current liabilities, including provision for current taxes of $1,286,206, totaled $1,680,984, while reserve for contingencies was $2,360,036. Current assets do not include inventories of sulfur above ground or materials and supplies, according to H. F. J. Knobloch, treasurer.

Mathieson Alkali

Report of Mathieson Alkali for quarter ended Mar. 31, shows net income of $350,180 after depreciation, depletion, federal taxes, etc., equivalent after dividend requirements on 7% preferred to 37c a share on 830,708 shares of no par common stock.

This compares with $277,627 or 38c a share on 623,263 common in first quarter of previous year. Net income for first quarter of '35 was 26% greater than for the similar quarter of '34, and was the best showing for the first quarter in 5 years.

Consolidated Chemical Industries

Consolidated Chemical Industries reports for quarter a net profit after depreciation, interest, Federal taxes and other charges, $115,045, equal, if applied directly to Class A stock without consideration of participating provisions, to 51c a share on 225,000 no-par shares of $1.50 cumulative Class A preference stock, against $126,277, or 60c a share on 211,000 shares last year.

Hercules Powder

Net earnings of Hercules Powder, for the first quarter, were $797,060 as compared with $872,926 earned in the same quarter of '34. The 1935 figure represents $1.05 a share on 583,533 outstanding shares of no par common following payment of $184,686 preferred dividends. Comparable '34 earnings amounted to $1.18, while 71c was earned in the last quarter of '34. Dividends of 75c a share were paid on the common during the quarter.

American I. G.

Net profit of American I. G. Chemical for fiscal year ended Mar. 31 was $2,527,-867 after interest, taxes, general expenses and other charges and including $632,-319 non-recurring income. This is equivalent to $3.22 a share on 486,319 common A shares outstanding and to 32c a share on the 3,000,000 common B shares outstanding. Net profit of $1,320,325 in the previous year was equal to $1.68 a common A share and 17c a common B share.

Total income amounted to $4,308,377, leaving a profit of $3,990,884 before debenture interest, or 2.73 times interest requirements, compared with $2,818,031, or 1.88 times such requirements in the preceding year.

In making public the annual report, board of directors announced declaration of an annual dividend of $2 and a special dividend of 50c on the common A shares and an annual dividend of 20c and a special dividend of 5c on the common B shares.

National Lead

Profits of National Lead were considerably higher in first quarter of '35 than in the same period last year, Edward J. Cornish, chairman, told stockholders at the annual meeting. Company's tonnage so far this year is also running considerably higher.

Business so far in '35, Mr. Cornish continued, is the best for any similar period since '30 but is behind the average of the past 8 years. Every branch of all subsidiaries of National Lead is making more money and are doing better this year than it was a year ago, Mr. Cornish stated. He declared that investments of the company in Europe were averaging better profits than those in the U. S.

A. A. C.

American Agricultural Chemical, due to a gain of about 10% in fertilizer sales in the current season, showed earnings per share for the 3rd quarter of its fiscal year nearly double that of a year ago. Beyond a certain point increase in volume brings a sharp increase in earnings.

AAC makes the bulk of its profits in the spring selling season which comprises the last 6 months of its fiscal year. In the full year ended June 30, '34 net profit was $979,119 or $4.19 a share on 233,206 shares, of which only $26,486 or 8c a share was earned in the first 9 months. With a better showing so far this year, profits should total over $5 a share for the full year, according to a report appearing in the *Wall St. Journal.*

For quarter ended March 28, last, the indicated net profit (based upon a comparison of the company's reports for 6 months ended Dec. 31, and 9 months ended March 28), was $521,494 after taxes and charges equal to $2.28 a share comparing with an indicated net loss of $22,776 in preceding quarter and net profit of $399,835 or $1.26 a share on 315,661 shares in March quarter of previous year.

Earnings Statements Summarized

Company:	Annual dividends	Net income 1935	Net income 1934	Common share earnings 1935	Common share earnings 1934	Surplus after dividends 1935	Surplus after dividends 1934
Air Reduction Co., Inc. (ADN):							
March 31 quarter	$3.00	$1,254,008	$994,284	*h*$1.50	*h*$1.21	*......	*.......
Am. Agricult'l Chem. Co. of Del. (AHD):							
††March 28 quarter	2.00	521,494	399,835	*h* 2.28	*h* 1.26	*......	*.......
Nine months, March 28 ...	2.00	396,262	26,486	*h* 1.73	*h* .08	*......	*.......
American I. G. Chemical Corp. (AIG):							
Year, March 31	*a*§ 2.00	2,527,867	1,320,326	*a* 3.22	*a* 1.68	......	....
Catalin Corp. of America:							
March 31 quarter	*f*....	‡97,402	‡49.243	....	....	......	....
Corn Products Refining Co. (CFG):							
March 31 quarter	3.00	2,134,452	2,298,411	.67	.74	*d*191,339	*d*24,434
International Printing Ink Corp. (INK):							
March 31 quarter	*z*.25	209,507	256,083	*h*.48	*h*.69	......	....
Glidden Co. (GLN):							
Five months, March 31 ...	§1.00	917,698	575,724	1.12	.60	......	....
Lindsay Light & Chemical Co.:							
March 31 quarter	.40	19,345	9,000	.26	.09	......	....
Penick & Ford (PFK):							
March 31 quarter	§3.00	271,318	277,886	*h*.73	*h*.71	*......	*.......
Mathieson Alkali Works, Inc. (AKL):							
March 31 quarter	1.50	350,180	277,627	*h*.37	*h*.38	*......	*.......
Union Carbide & Carbon Corp. (UN):							
March 31 quarter	*k*1.25	5,293,629	4,337,939	.59	.48	*......	*.......
Westvaco Chlorine Prod'ts Corp. (WOC):							
March 31 quarter	.40	162,233	160.314	.43	.42	......	....

h On shares outstanding at close of respective periods; * Not available; *a* On class A stock; § Plus extras; *f* No common dividend; ‡ Indicated quarterly earnings; *d* Deficit; *z* Last dividend declared; period not announced by company.

Foreign Markets

April 30th closing quotations on the London Exchange: British Celanese, 9s.6d.; Celanese, £4¼; Courtaulds, 52s. 3d.; Imperial Chemical Industries, 35s.; Unilever, 27s.6d. On the Paris Bourse, Air Liquide, 790 (francs). In Berlin, I. G. Farben, 138 (marks), ex-dividend. In Milan, Montecatini, 174 (lire).

"Over-the-Counter"

Some of the more important "over-the-counter" closing (Apr. 30th) prices: American Hard Rubber, 4-6½; Merck & Co., 26-28; Merck preferred, 117-119½; Worcester Salt, 50; J. S. Young, 100; J. S. Young preferred, 108.

Chemical Stocks and Bonds

Last	1935 April High	1935 April Low	1934 High	1934 Low	1933 High	1933 Low	Sales: Number of shares April 1935	Sales: Number of shares 1935	Stocks	Par $	Shares Listed	An. Rate*	Earnings $-per share-$ 1934	Earnings $-per share-$ 1933
NEW YORK STOCK EXCHANGE														
120	120	104⅜	113	91¼	112	47½	14,400	39,700	Air Reduction	No	841,288	$4.50	4.98	3.79
144	146	125	160¾	115⅛	152	70¾	29,300	67,200	Allied Chem. & Dye	No	2,214,099	6.00	6.83	5.50
123⅛	127½	122½	130	122⅛	125	115	4,300	8,300	7% cum. pf.	100	345,540	7.00	50.79	42.24
51¼	57¾	42	48	25¼	35	7¼	17,400	53,500	Amer. Agric. Chem.	100	315,701	2.00	.....	p4.19
23½	33¼	22½	62½	20¾	89⅞	13	17,200	73,400	Amer. Com. Alcohol	20	260,716	None	.....	4.56
39⅜	41¼	36	39⅛	26¼	29¼	9¾	5,900	30,400	Archer-Dan-Midland	No	541,546	1.50	.....	p3.82
36	43	32¾	55½	35¼	39⅛	9	9,300	25,600	Atlas Powder Co.	No	234,235	2.00	2.49	.74
111	111¾	106¾	106¾	83	83⅛	60	1,020	2,410	6% cum. pfd.	100	88,781	6.00	13.54	8.38
20½	35⅜	19½	44⅞	17⅛	58⅞	4½	43,700	245,400	Celanese Corp. Amer.	No	987,800	None	1.25	3.32
16¾	18¼	16⅛	18⅛	9⅜	22⅜	7	19,300	123,200	Colgate-Palm.-Peet	No	1,985,812	.75	1.16	— .57
104	105½	101	102½	68½	88	49	1,800	9,400	6% pfd.	100	254,500	6.00	15.14	1.51
77	80¼	67	77¼	58	71½	23⅛	27,200	70,700	Columbian Carbon	No	538,154	3.40	3.93	2.17
19¼	23⅞	17⅝	36¾	15¾	57¼	9	97,400	443,500	Commer. Solvents	No	2,635,371	.85	.89	.88
67¾	68¾	62	84½	55½	90⅝	45⅜	25,000	81,500	Corn Products	25	2,530,000	3.00	3.16	3.87
161	161	149	150½	135	145¾	117½	1,100	3,500	7% cum. pfd.	100	243,739	7.00	39.65	46.02
41	50⅜	36	55¼	29	33⅞	10	500	5,100	Devoe & Rayn. A	No	95,000	2.00	2.36	3.82
96¾	99½	86⅝	103⅞	80	95⅞	32⅛	84,700	267,500	DuPont de Nemours	20	10,871,997	3.15	3.63	2.93
128	131	126⅞	128½	115	117	97½	2,800	12,900	6% cum. deb.	100	1,092,699	6.00	42.73	35.58
138	146	110½	116½	79	89¾	46	28,600	79,900	Eastman Kodak	No	2,250,921	4.00	6.28	4.76
152	155	141	147	120	130	110	540	2,520	6% cum. pfd.	100	61,657	6.00	235.22	180.34
21½	26	17¼	50⅜	21½	49⅜	16⅛	12,800	65,700	Freeport Texas	10	784,664	2.00	1.76	3.01
...	...	...	160⅛	113½	160⅛	97	......	1,100	6% conv. pfd.	100	25,000	6.00	120.08	156.73
27½	29	23⅜	28⅜	15⅝	20	3¾	24,700	69,100	Glidden Co.	No	603,304	.90	.....	1.54
109¼	109¼	104⅞	107½	83	91½	48	1,070	2,490	Glidden, 6% pfd.	100	63,044	7.00	.....	22.60
95	94½	85	96⅞	74	85⅞	65	5,100	18,200	Hazel Atlas	25	434,409	5.00	5.21	6.22
75	77⅝	71	81⅝	59	68⅝	15	3,900	17,600	Hercules Powder	No	582,679	3.00	3.94	2.79
126½	127½	122	125¾	111	110⅛	85	250	1,560	7% cum. pfd.	100	105,765	7.00	28.79	22.38
25⅛	33	24⅛	32	19⅜	85	24	28,000	183,700	Industrial Rayon	No	600,000	1.68	2.23	3.01
3½	5	2¾	6⅛	2	5⅞	⅞	5,100	39,700	Intern. Agricul.	No	436,049	None	.....	p .69
37⅛	42¾	31	37¼	15	23½	5	1,700	15,700	7% cum. pr. pfd.	100	100,000	None	.....	p4.00
27	27⅜	22¼	29¼	21	23¼	6¾	203,300	538,200	Intern. Nickel	No	14,584,025	.60	1.14	.53
32¾	32½	29	32	21	27¾	13¾	3,100	7,700	Intern. Salt	No	240,000	1.50	2.02	2.04
34½	36	32	33⅛	15¾	22	7½	3,600	17,400	Kellogg (Spencer)	No	500,000	1.60	.....	v3.01
25	32¾	21½	43⅞	22½	37⅜	4⅜	65,400	215,800	Libbey Owens Ford	No	2,559,042	1.20	1.25	1.64
28¼	30⅞	24½	35⅜	16⅛	50	10¼	13,200	51,300	Liquid Carbonic	No	342,406	1.25	.....	v1.05
28	32	23¾	40¾	23½	46⅝	14	18,300	84,800	Mathieson Alkali	No	650,436	1.50	1.20	1.70
66½	67¾	55	61⅝	39	83	25	20,300	55,500	Monsanto Chem.	10	864,000	1.25	3.03	2.57
166	168½	145	170	135	140	43¼	1,800	5,700	National Lead	100	309,831	5.00	8.38	6.98
160⅛	160⅛	150	146½	122	128¼	101	600	1,640	7% cum. "A" pfd	100	243,676	7.00	20.12	18.35
133	136	121⅝	121½	100½	109⅛	75	200	1,040	6% cum. "B" pfd.	100	103,277	6.00	35.36	30.45
6	8	4⅜	13	5½	11¾	1⅜	4,700	29,700	Newport Industries	1	519,347	None	.31	.05
91	93	80	94	60	96¾	31½	12,500	41,700	Owens-Illinois Glass	25	1,200,000	4.00	5.41	4.86
48⅝	49⅝	42⅜	44⅜	33⅛	47½	19⅝	31,800	127,600	Procter & Gamble	No	6,410,000	1.70	.....	p 2.11
118	120½	115	117	102½	110¾	97	820	2,420	5% pfd. (ser. 2-1-29)	100	171,569	5.00	.....	p73.15
4⅞	5½	4	6¾	3⅛	7¼	1⅜	12,800	33,900	Tenn. Corp.	5	857,896	None	.27	— .11
30⅞	36¾	28¾	43¼	30	45¼	15¼	44,800	143,600	Texas Gulf Sulphur	No	2,540,000	2.00	1.81	2.93
51½	52⅞	44	50⅞	35⅞	51⅞	19¾	131,700	329,400	Union Carbide & Carbon	No	9,000,743	1.60	2.28	1.59
53	53⅞	46	50⅜	35	37¾	10¼	18,900	75,200	United Carbon	No	370,127	2.40	3.55	1.39
41½	45½	35⅛	64¾	32	94	13½	26,500	73,000	U. S. Indus. Alco.	No	391,033	None	4.04	3.56
12	21¾	11¼	31¾	14	36¼	7⅝	31,000	81,100	Vanadium Corp.-Amer.	No	366,637	None	—2.29	—2.40
3⅜	4⅝	2½	5⅜	1⅞	7⅜	⅝	7,300	39,800	Virginia-Caro. Chem.	No	486,000	None	.....	p—2.46
21½	27¼	18	26	10	26½	3⅜	7,000	58,200	6% cum. part. pfd.	100	213,392	None	.....	p .52
98⅛	100	85	84	59¾	63½	35⅜	600	3,300	7% cum. prior pfd.	100	60,000	None	.....	p9.06
19½	23½	16¾	27¼	14⅞	20½	5	4,500	21,200	Westvaco Chlorine	No	284,962	.40	1.55	1.08
NEW YORK CURB EXCHANGE														
17¾	17⅞	15	22½	14⅝	16½	3¼	47,100	171,800	Amer. Cyanamid "B"	No	2,404,194	m .10	.99	.99
2¼	3⅛	2	4⅛	2⅜	4½	1	900	3,600	British Celanese Am. R.	243	....	None	.....	.....
93½	110	93	105¼	81	110	27	1,050	11,500	Celanese, 7% cum. 1st pfd.	100	144,379	7.00	16.37	32.24
99	105	97½	102	83	90	51	275	2,775	7% cum. prior pfd.	100	113,668	7.00	28.13	47.98
8	15	8	19	7	26⅞	2	825	3,975	Celluloid Corp.	15	194,952	None	—1.67	—1.00
12½	12½	11⅝	14⅜	10½	11⅝	4⅛	800	5,600	Courtaulds' Ltd.	1 £	24,000,000	4½ %	.....	.....
92⅛	95⅛	80½	91	67½	78	30	6,600	25,500	Dow Chemical	No	945,000	2.00	.....	†3.60
9¾	12½	8¾	10¾	4	8	½	3,500	20,200	Duval Texas Sulphur	No	500,000	None	.....	z .08
44	44	37	40¾	19	19	8	2,400	8,200	Heyden Chem. Corp.	10	147,600	1.35	3.07	2.74
56	58	46¾	57½	39	39⅞	13	10,450	33,000	Pittsburgh Plate Glass	25	2,141,305	1.40	2.69	1.87
91	91	84	90½	47¼	47	12⅞	11,200	38,300	Sherwin Williams	25	635,583	3.00	.....	y3.54
111¼	113½	108	109¾	100	99	80	800	2,220	6% pfd. AA. cum.	100	155,521	6.00	.....	y20.78
PHILADELPHIA STOCK EXCHANGE														
79	79	70	75	50¼	57	25¼	1,079	1,654	Pennsylvania Salt	50	150,000	3.00	.....	p5.07

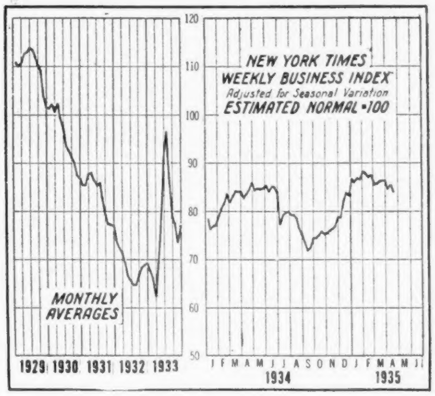
Last	1935 April High	1935 April Low	1934 High	1934 Low	1933 High	1933 Low	Sales April 1935	Sales 1935	Bonds	Date Due	Int. %	Int. Period	Outstanding $
NEW YORK STOCK EXCHANGE													
108⅜	108¼	104½	106¾	83⅞	89	64	636,000	1,863,000	Amer. I. G. Chem. Conv. 5½'s	1949	5½	M. N.	29,929,000
9½	11	7⅜	17¾	5	14⅛	2⅛	92,000	409,000	Anglo Chilean s. f. deb. 7's	1945	7	M. N.	12,700,000
86	87½	77⅜	88	61½	74⅞	37	37,000	290,000	By-Products Coke Corp. 1st 5½'s "A"	1945	5½	M. N.	4,932,000
98½	99¾	91⅛	92	62	65	38½	231,000	745,000	Int. Agric. Corp. 1st Coll. tr. stpd. to 1942	1942	5	M. N.	5,994,100
8¾	10⅜	7	19½	5⅛	14⅞	2½	356,000	1,386,000	Lautaro Nitrate conv. b's	1954	6	J. J.	31,357,000
91¾	93½	89	98½	89⅞	99⅛	87	32,000	274,000	Montecatini Min & Agric. det. 7's with war.	1937	7	J. J.	7,075,045
36	38	35	74½	34½	62	33¾	1,000	13,000	Ruhr Chem. 6's	1948	6	A. O.	3,156,000
100	100	91½	90	65½	76	50	59,000	174,000	Tenn. Corp. deb. 6's "B"	1944	6	M. S.	3,007,900
75¾	94¼	66	89½	62	81	34¾	230,000	886,000	Vanadium Corp. conv. 5's	1941	5	A. O.	4,261,000
NEW YORK CURB EXCHANGE													
101¼	104	101¼	104⅝	101⅜	103½	101	3,000	60,000	Westvaco Chlorine Prod. 5½'s	1937	5½	M. S.	1,393,000

† Year ended 5-31-34; *m* Last paid, no regular rate; *p* Year ended 6-30-34; *v* Year ended 9-1-34; *y* Year ended 8-31-34; *z* Year ended 8-31-34;
* Including extras.

Industrial Trends

¶*April Business Activity is Fairly Well Sustained — Textile Industry Sorely Depressed—Business Leaders Ask for Stability—*

Under the stimulus of week-end promotions and late Easter buying April retail trade sales were from 4 to 12% higher than in April of last year. Unseasonal weather cut into sales in certain sections and the increase was somewhwat under what was first looked for. Buying in rural sections was better than in urban centers. Sustained buying in May is looked for as a result of the large amount of deferred April purchasing. Wholesale trade last month it is estimated was about 10 to 20% above the '34 level.



"Times" Index of Business Activity declines to a low point for the year, largely because of the severe decline in cotton cloth production

Activity in the so-called heavy industries was, generally speaking, still encouraging. Automotive production figures for April were well above the 400,000 unit mark (April '34 production was 378,108 units), steel mills were slightly busier early in April, but the rate of 43% prevailing at the close does not compare favorably with the 56% rate of a year ago. After the feverish production in the bituminous sections in March, a decided let-up was reported last month.

Textiles Discouraging

Textiles do not present a very encouraging picture. Particularly is this true in cotton cloth production. Rate of activity, according to the *N. Y. Times* Index, continued in April the decline of the last few months, the index dropping from 86.6 on Mar. 30 to 71.3 on Apr. 30. Further curtailment over the next few months is the gloomy outlook and manufacturers are genuinely alarmed at the sudden increase in imported cloth coming in from Japan. Other divisions of the industry, silk and rayon, are fairly active but the woolen companies are operating at reduced schedules.

Electric production continues ahead of last year's figures but the seasonal peak is over and the decrease in textile operations has been noticeable. Freight car loadings hovered close to the corresponding '34 figures for the first three weeks of the month, but declined sharply in the week of Apr. 27. This was caused by the introduction of the higher freight rates in many commodities, buyers specifying earlier deliveries in the month in many cases. Loadings in the first 17 weeks of this year have declined 0.9% from the same period of '34.

The larger chemical consuming industries other than textiles show definite seasonal upswing. Paint sales are ahead of last year by a rather wide margin and over double the '33 total; tanning operations are being increased; paper production is slightly increased; while activity in the Akron centers remains satisfactory after a flurry of labor disturbances. Fertilizer sales are satisfactory. The glass industry is busy.

Speculation in Silver

Commodity prices were generally higher as the various indices, *N. Y. Journal of Commerce*, Dept. of Labor and Fishers shown below indicate quite clearly. A wild speculative spurt in silver helped to carry along other commodities. This and the growing fear of inflation as the Administration continues to favor huge expenditures and fails to take adequate steps towards balancing of the budget was responsible for the advances. The jump in silver caused wide advances in raw materials coming out of the Orient and is giving importers and consumers alike no end of trouble.

As a result of the increased rate of production in most industrial divisions chemical production schedules were set at a higher pace than that prevailing in March. The price structure remains generally firm and unchanged.

The optimistic note so prevalent early in the month was toned down considerably in the first few days of May when both the National Association of Manufacturers and the U. S. Chamber of Commerce took more decided stands on many of the leading policies of the administration, condemning many in no uncertain terms. Industrial leaders feel that the jam is ready to be broken if business can be assured greater stability and less experimentation.

Statistics of Business

	March 1935	March 1934	February 1935	February 1934	January 1935	January 1934
Automotive production	447,561	345,443	304,544	231,707	292,765	156,907
Bldg. contracts*‡	$123,043	$179,161	$75,083	$96,716	$99,773	$186,463
Failures, Dun & Bradstreet	976	1,102	1,005	1,049	1,184	1,364
Merchandise imports‡	$177,279	$158,105	$152,288	$125,047	$168,623	$135,706
Merchandise exports‡	$185,001	$190,890	$160,312	$159,595	$173,560	$172,221
Newsprint Production						
Canada, tons	......	......	180,305	174,447	201,959	188,374
U. S., tons	......	......	70,805	72,402	80,666	84,194
Newfoundland, tons	......	......	24,604	22,038	28,012	25,477
Total, tons	......	......	277,457	246,849	312,703	299,278
Plate Glass prod., sq. ft. ..	......	......	13,723,151	7,441,278	13,365,188	7,607,195
Steel ingots production ...	2,830,700	2,761,438	2,742,125	2,183,160	2,834,170	1,971,187
Steel activity, % capacity	49.18	......	51.61	41.31	47.67	33.16
Pig iron production	1,770,000	1,619,534	1,608,552	1,263,673	1,477,336	1,215,226
U. S. consumption, crude rubber, tons	42,620	47,097	43,187	40,609	47,103	......
Tire shipments	......	......	......	......	3,662,615	3,222,398
Tire production	......	......	......	......	4,626,473	3,921,587
Tire inventory	......	......	......	......	10,397,667	9,684,389
Dept. of Labor Indices						
Factory payrolls, totals† ..	70.8	64.8	69.1	60.6	64.1	63.2
Factory employment† ...	82.4	80.8	81.2	78.4	80.5	75.1
Chemical price index† ...	......	......	86.5	78.8	84.5	78.8
Chemical employment†*a* ..	113.9	113.4	109.9	104.8	108.3	107.9
Chemical payrolls†*a*	96.0	88.3	92.5	87.2	91.5	84.5
Chemicals and Related Products						
Exports‡	$9,077	......	$7,203	......	$7,326	......
Imports‡	$6,099	......	$6,953	......	$6,597	......
Stocks, mfd. goods†	......	126	......	129	118	126
Stocks, raw materials† ..	......	101	......	108	107	117

Week Ending	Carloadings 1935	Carloadings 1934	Carloadings % of Change	Electrical Output§ 1935	Electrical Output§ 1934	Electrical Output§ % of Change	Jour. of Com. Price Index	National Fertilizer Association Indices: Metals	Fats & Oils	Chem. & Drugs	Mixed Fert.	Fert. Mat.	All Groups	Labor Dept. Chem. & Drug Price Index	% Steel Activity	Fisher's Index Purch. Power	N. Y. Times Index Bus. Act.
Mar. 30....	617,485	610,190	+1.2	1,712,863	1,665,650	+2.8	78.3	81.7	79.5	94.4	76.1	65.2	77.2	80.4	44.4	124.1	86.1
Apr. 6....	545,627	559,070	—2.4	1,700,334	1,616,945	+5.2	79.3	81.8	82.8	94.4	76.1	65.2	77.7	80.2	43.8	123.5	84.6
Apr. 13....	587,685	579,981	+1.3	1,725,352	1,642,187	+5.1	80.3	82.1	84.2	94.4	76.1	65.2	78.3	80.5	44.0	122.5	85.6
Apr. 20....	610,905	591,705	+3.2	1,701,945	1,672,765	+1.7	79.9	82.2	78.3	94.4	76.0	65.3	78.2	80.7	44.6	122.7	84.1
Apr. 27....	558,886	609,704	—8.3	....	....	....	79.7	82.5	78.2	94.4	76.0	65.3	78.3	80.8	43.1	122.2	81.3

* 37 states, F. W. Dodge Corp.; ‡ 000 omitted; † Dept. of Labor, 3 year average, 1923-1925 = 100.0; *a* Includes all allied products but not petroleum refining; § k.w.h., 000 omitted.

Prices Current

Heavy Chemicals, Coal-tar Products, Dye-and-Tanstuffs, Colors and Pigments, Fillers and Sizes, Fertilizers and Insecticide Materials, Petroleum Solvents and Chemicals, Naval Stores, Fats and Oils, etc.

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f. o. b. works are specified as such. Import chemicals are so designated. Resale stocks when a market factor are quoted in addition to maker's prices and indicated "second hands."

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both. Containers named are the original packages most commonly used.

Purchasing Power of the Dollar: 1926 Average—$1.00 - 1934 Average $1.31. - Jan. 1935 $1.23 - April 1935 $1.23

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Acetaldehyde, drs c-l, wks lb.	...	.14	...	.14	.14	.16½
Acetaldol, 95%, 50 gal drs wks ... lb.	.21	.25	.21	.25	.21	.31
Acetamide, tech, lcl, kegs .. lb.	.38	.43	.38	.43	.40	1.35
Acetanalid, tech, 150 lb bbls lb.	.24	.26	.24	.26	.24	.26
Acetic Anhydride, 100 lb cbys ... lb.	.21	.25	.21	.25	.21	.25
Acetin, tech, drs ... lb.	.22	.24	.22	.24	.22	.32
Acetone, tks, delv ... lb.	.11	.12	.11	.12	.10	.12
drs, c-l, delv ... lb.	...	.12	...	.12	.12	.12
Acetyl chloride, 100 lb cbys lb.	.55	.68	.55	.68	.55	.68
ACIDS						
Abietic, kgs, bbls ... lb.	.06¾	.07	.06¾	.07	.06	.07
Acetic, 28%, 400 lb bbls, c-l, wks ... 100 lbs.	...	2.45	2.40	2.45	2.40	2.91
glacial, bbls, c-l, wks 100 lbs.	...	8.43	8.25	8.43	8.25	10.02
glacial, USP, bbls, c-l, wks ... 100 lbs.	...	12.43	12.25	12.43	...	12.25
Adipic, kgs, bbls ... lb.	...	.72	...	.72	.72	.72
Anthranilic, refd, bbls ... lb.	.85	.95	.85	.95	.85	.95
tech, bbls ... lb.	...	.75	...	.75	.65	.75
Battery, cbys, delv .. 100 lbs.	1.60	2.25	1.60	2.25	1.60	2.25
Benzoic, tech, 100 lb kgs .. lb.	.40	.45	.40	.45	.40	.45
USP, 100 lb kgs ... lb.	.54	.59	.54	.59	...	...
Boric, tech, gran, 80 tons, bgs, delv ... ton *a*	...	80.00	...	80.00	80.00	80.00
Broenner's, bbls ... lb.	1.20	1.25	1.20	1.25	1.20	1.25
Butyric, 95%, cbys ... lb.	.53	.60	.53	.60	.53	.85
edible, c-l, wks, cbys ... lb.	1.20	1.30	1.20	1.30	1.20	1.30
synthetic, c-l, drs ... lb.	...	.22	...	.22	.22	.22
wks ... lb.	...	.23	...	.23	.23	.23
tks, wks ... lb.	...	.21	...	.21	.21	.21
Camphoric, drs ... lb.	...	5.25	...	5.25	5.25	5.25
Chicago, bbls. ... lb.	...	2.10	...	2.10	2.10	2.10
Chlorosulfonic, 1500 lb drs, wks ... lb.	.04½	.05½	.04½	.05½	.04½	.05½
Chromic, 99¾%, drs, delv lb.	.13¾	.15¾	.13¾	.15¾	.13½	.15¾
Citric, USP, crys, 230 lb bbls ... lb. *b*	.28	.29	.28	.29	.28	.30
anhyd, gran, drs ... lb. *b*	...	.31	...	.31	.31	.31
Cleve's, 250 lb bbls ... lb.	.52	.54	.52	.54	.52	.54
Cresylic, 99%, straw, HB, drs, wks, frt equal .. gal.	.46	.47	.46	.47	.46	.47
99%, straw, LB, drs, wks, frt equal ... gal.	.64	.65	.64	.65	.64	.65
resin grade, drs, wks, frt equal ... gal.	.54	.55	.54	.55	.54	.55
Crotonic, drs ... lb.	.90	1.00	.90	1.00	.90	1.00
Formic, tech, 140 lb drs .. lb.	.11	.13	.11	.13	.11	.13
Fuming, see Sulfuric (Oleum)						
Fuoric, tech, 90%, 100 lb. drs. ... lb.	...	.35	...	.35	...	.35
Gallic, tech, bbls ... lb.	.65	.68	.65	.68	.60	.70
USP, bbls ... lb.	.70	.80	.70	.80	.74	.80
Gamma, 225 lb bbls, wks .. lb.	.77	.79	.77	.79	.77	.79
H, 225 lb. bbls, wks ... lb.	.50	.55	.50	.55	.50	.70
Hydriodic, USP, 10% sol. cbys ... lb.	.50	.51	.50	.51	.50	.51
Hydrobromic, 48% com 155 lb cbys, wks ... lb.	.45	.48	.45	.48	.45	.48
Hydrochloric, see muriatic.						
Hydrocyanic, cyl, wks ... lb.	.80	1.30	.80	1.30	.80	1.30
Hydrofluoric, 30%, 400 lb bbls, wks ... lb.	.07	.07½	.07	.07½	.07	.07½
Hydrofluosilicic, 35%, 400 bbls, wks ... lb.	.11	.12	.11	.12	.11	.12
Lactic, 22%, dark, 500 lb bbls ... lb.	.04½	.05	.04½	.05	.04	.05
22%, light refd, bbls .. lb.	.06½	.07	.06½	.07	.06½	.07
44%, light, 500 lb bbls .. lb.	.11½	.12	.11½	.12	.11½	.12
44%, dark, 500 lb bbls .. lb.	.09½	.10	.09½	.10	.09	.10
USP X, 95%, cbys ... lb.	.45	.50	.45	.50	...	...
USP VIII, 75%, cbys .. lb.	.43	.48	.43	.48	...	...
Laurent's, 250 lb bbls ... lb.	.36	.37	.36	.37	.36	.37
Linoleic, bbls ... lb.	.16	.16	.16	.16	.16	.16
Maleic, powd, kgs ... lb.	.29	.32	.29	.32	.25	.32
Malic, powd, kgs ... lb.	.45	.60	.45	.60	.45	.60
Metanillic, 250 lb bbls ... lb.	.60	.65	.60	.65	.60	.65
Mixed, tks, wks ... N unit	.06½	.07¼	.06½	.07¼	.06½	.07¼
S unit	.008	.009	.008	.009	.008	.01
Monochloracetic, tech, bbls lb.	.16	.18	.16	.18	.16	.18
Monosulfonic, bbls ... lb.	1.50	1.60	1.50	1.60	1.50	1.60
Muriatic, 18°, 120 lb cbys, c-l, wks ... 100 lb.	...	1.35	...	1.35	...	1.35
tks, wks ... 100 lb.	...	1.00	...	1.00	...	1.00
20°, cbys, c-l, wks .. 100 lb.	...	1.45	...	1.45	...	1.45
tks, wks ... 100 lb.	...	1.20	...	1.20	...	1.20
22°, c-l, cbys, wks .. 100 lb.	...	1.95	...	1.95	...	1.95
tks, wks ... 100 lb.	...	1.60	...	1.60	...	1.60
CP, cbys ... lb.	.06½	.07⅛	.06½	.07⅛	.06½	.07⅛
N & W, 250 lb bbls ... lb.	.85	.87	.85	.87	.85	.87
Naphthenic, drs ... lb.	.12	.13	.12	.13	.10	.13
Naphthionic, tech, 250 lb bbls ... lb.	.60	.65	.60	.65	.60	.65
Nitric, 36°, 135 lb cbys. c-l, wks ... 100 lb. *c*	...	5.00	...	5.00	...	5.00
38°, c-l, cbys, wks .. 100 lb. *c*	...	5.50	...	5.50	...	5.50
40°, cbys, c-l, wks .. 100 lb. *c*	...	6.00	...	6.00	...	6.00
42°, c-l, cbys, wks .. 100 lb. *c*	...	6.50	...	6.50	...	6.50
CP, cbys, delv ... lb.	.11½	.12½	.11½	.12½	.11½	.12½
Oxalic, 300 lb bbls, wks, or N. Y. ... lb.	.11½	.12½	.11½	.12½	.11½	.12⅛
Phosphoric, 50%, USP, cbys ... lb.	.14	.14	.14	.14	.14	.14
50%, acid, c-l, drs, wks .. lb.	.06	.08	.06	.08	.05	.08
75%, acid, c-l, drs, wks .. lb.	.09	.10½	.09	.10½	.07	.10½
Picramic, 300 lb bbls, wks. lb.	.65	.70	.65	.70	.65	.70
Picric, kgs, wks ... lb.	.30	.40	.30	.40	.30	.50
Pyrogallic, crys, kgs, wks .. lb.	1.55	1.65	1.55	1.65	1.40	1.65
Salicylic, tech, 125 lb bbls, wks ... lb.	...	.40	...	.40	.33	.40
Sebacic, tech, drs, wks ... lb.	...	.58	...	.58	...	.58
Sulfanilic, 250 lb bbls, wks lb.	.18	.19	.18	.19	.18	.19
Sulfuric, 60°, tks, wks ... ton	...	11.00	...	11.00	...	11.00
c-l, cbys, wks ... 100 lb.	...	1.10	...	1.10	...	1.10
66°, tks, wks ... ton	...	15.50	...	15.50	15.00	15.50
c-l, cbys, wks ... 100 lb.	...	1.35	...	1.35	...	1.35
CP, cbys, wks ... lb.	.06½	.07½	.06½	.07½	.06½	.07½
Fuming (Oleum) 20% tks, wks ... ton	...	18.50	...	18.50	...	18.50
Tannic, tech, 300 lb bbls ... lb.	.23	.40	.23	.40	.23	.40
Tartaric, USP, gran powd, 300 lb bbls ... lb.	...	.24	.24	.25	.25	.26
Tobias, 250 lb bbls ... lb.	.75	.80	.75	.80	.75	.80
Trichloroacetic bottles ... lb.	2.45	2.75	2.45	2.75	2.00	2.75
kgs ... lb.	...	1.75	...	1.75	...	1.75
Tungstic, tech, bbls ... lb.	1.50	1.60	1.50	1.60	1.35	1.70
Vanadic, drs, wks ... lb.	1.10	1.20	1.10	1.20	1.10	1.20
Albumen, light flake, 225 lb bbls ... lb.	.45	.53	.45	.53	.35	.53
dark, bbls ... lb.	.12	.17	.12	.17	.10	.17
egg, edible ... lb.	...	.90	.85	.90	.82	.92
vegetable, edible ... lb.	.65	.70	.65	.70	.65	.70
ALCOHOLS						
Alcohol, Amyl, tks, delv ... lb.	...	.143	...	.143	...	.143
c-l, drs, delv ... lb.	...	.15	...	.15	.15	.157
Amyl, secondary, tks, delv ... lb.	...	.108	...	.108	...	.108
c-l, drs, delv ... lb.	...	.118	...	.118	...	.118
Amyl, tertiary, tks, delv lb.	...	.052	.052	.072	...	.052
c-l, drs, delv ... lb.	...	.062	.062	.082	...	.062
Benzyl, bottles ... lb.	.65	1.10	.65	1.10	.75	1.10
Butyl, normal, tks, delv . lb. *d*	...	.12	...	.12	.09½	.12
c-l, drs, delv ... lb. *d*	...	.13	...	.13	.10½	.13
Butyl, secondary, tks, delv ... lb. *d*	...	.096	...	.096	.076	.096
c-l, drs, delv ... lb. *d*	...	.106	...	.106	.086	1.06
Capryl, drs, tech, wks .. lb.	...	.85	...	.85	.85	.85
Cinnamic, bottles ... lb.	3.25	3.65	3.25	3.65	3.25	3.65
Denatured, No. 5, c-l, drs, wks ... gal. *e*	...	.35½	.34	.35½	.30	.34
Western schedule, c-l, wks ... gal. *e*	...	.39½	.38	.39½	...	...
Denatured, No. 1, tks, wks ... gal. *e*	...	.31	.29½	.31	.29½	.304
c-l, drs, wks ... gal. *e*	...	.36	.34½	.36	...	...
Western schedule, tks, wks ... gal. *e*	...	.35	.32½	.35	...	...
c-l, drs, wks ... gal. *e*	...	.40	.37½	.40	...	...
Diacetone, tech, tks, delv ... lb. *f*	...	.16	...	.16	...	...
c-l, drs, delv ... lb. *f*	...	.17	...	.17	...	.17

a Powdered boric acid $5 a ton higher in each case; USP $15 higher; *b* Powdered citric is ½c higher; kegs are in each case ½c higher than bbls.

c Yellow grades 25c per 100 lbs. less in each case; *d* Spot prices are 1c higher; *e* Anhydrous is 5c higher in each case; *f* Pure prices are 1c higher in each case.

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less-than-carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.

Prices Current

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Alcohols (continued)						
Ethyl, 190 proof, molasses,						
tks ....gal. *g*	...	4.10	4.08½	4.10	...	4.08½
c-l, drs ....gal. *g*	4.17	4.27	4.13½	4.27	...	4.13½
c-l, bbls ....gal. *g*	4.18	4.28	4.15½	4.28	4.12½	4.24½
absolute, drs ......gal. *g*	4.57½	6.11½	4.55½	6.11½	...	...
Furfuryl, tech, 500 lb, drs ....lb.	...	.35	...	.35	.35	.40
Hexyl, secondary tks, delv lb.	...	.11½	...	.11½	...	.11½
c-l, drs, delv ....lb.	...	.12½	...	.12½	...	.12½
Normal, drs, wks ....lb.	3.25	3.50	3.25	3.50	3.25	3.50
Isoamyl, prim, cans, wks lb.	4.00	4.50	4.00	4.50	4.00	4.50
Isobutyl, refd, lcl, drs ..lb.	...	.12	.12	.60	.60	.75
c-l, drs ....lb.	...	.11½	...	...	...	...
tks ....lb.	...	.10½	...	...	...	...
Isopropyl, refd, c-l, drs..lb.	...	.55	...	.55	.45	.55
Propyl, norm, 50 gal drs gal.	...	.75	...	.75	...	.75
Special Solvent, tks, wks gal.	...	.32	...	...	...	...
Western points, tks, wks ....gal.	...	.35	...	...	...	...
Aldehyde ammonia, 100 gal drs ....lb.	.80	.82	.80	.82	.80	.82
Alphanaphthol, crude, 300 lb bbls ....lb.	.60	.65	.60	.65	.65	.70
Alphanaphthylamine, 350 lb bbls ....lb.	.32	.34	.32	.34	.32	.34
Alum, ammonia, lump, c-l, bbls, wks ....100 lb.	...	3.00	...	3.00	2.90	3.00
25 bbls or more, wks ....100 lb.	...	3.15	...	3.15	...	3.15
less than 25 bbls, wks ....100 lb.	...	3.25	...	3.25	...	3.25
Granular, c-l, bbls, wks 100 lb.	...	2.75	...	2.75	...	2.75
25 bbls or more, wks 100 lb.	...	2.90	...	2.90	...	2.90
Powd, c-l, bbls, wks 100 lb.	...	3.15	...	3.15	...	3.15
25 bbls or more, wks 100 lb.	...	3.30	...	3.30	...	3.30
Chrome, bbls ......100 lb.	7.00	7.25	7.00	7.25	6.50	7.25
Potash, lump, c-l, bbls, wks ....100 lb.	...	3.25	...	3.25	...	3.25
25 bbls or more, wks 100 lb.	...	3.40	...	3.40	...	3.40
Granular, c-l, bbls, wks 100 lb.	...	3.40	...	3.00	...	3.00
25 bbls or more, bbls, wks ....100 lb.	...	3.00	...	3.15	...	3.15
Powd, c-l, bbls, wks 100 lb.	...	3.40	...	3.40	...	3.40
25 bbls or more, wks 100 lb.	...	3.55	...	3.55	...	3.55
Soda, bbls, wks .....100 lb.	4.00	4.15	4.00	4.15	3.50	4.15
Aluminum metal, c-l NY ....100 lb.	20.00	23.30	20.00	23.30	20.00	24.30
Acetate, CP, 20%, bbls lb.	.09	.10	.09	.10	.09	.10
Chloride anhyd, 99%, wks ....lb.	.07	.12	.07	.12	.07	.12
93%, wks ....lb.	.05	.08	.05	.08	.04	.08
Crystals, c-l, drs, wks ...lb.	.06½	.07	.06½	.07	.06½	.01
Solution, drs, wks ......lb.	.03	.03½	.03	.03½	.03	.03½
Hydrate, 96%, light, 90 lb. bbls, delv ....lb.	.13	.15	.13	.15	.13	.16½
heavy, bbls, wks .....lb.	.04	.04½	.04	.04½	.04	.04½
Oleate, drs ....lb.	...	.15¾	...	.15¾	...	.15¾
Palmitate, bbls ....lb.	.21	.22	.20	.22	.19	.21
Resinate, pp., bbls .....lb.	...	.15	...	.15	.12½	.15
Stearate, 100 lb bbls....lb.	.18	.20	.17	.20	.17	.18
Sulfate, com, c-l, bgs, wks ....100 lb.	...	1.35	...	1.35	1.35	1.35
c-l, bbls, wks .....100 lb.	...	1.55	...	1.55	1.55	1.55
Sulfate, iron-free, c-l, bgs, wks ....100 lb.	...	1.90	...	1.90	1.90	1.90
c-l, bbls, wks .....100 lb.	...	2.05	...	2.05	2.05	2.05
Aminoazobenzene, 110 lb kgs ....lb.	...	1.15	...	1.15	...	1.15
Ammonia anhyd com, tks..lb.	.04½	.05½	.04½	.05½	.04½	.05½
Ammonia anhyd, 100 lb cyl lb.	.15¼	.21½	.15¼	.21½	.15¼	.21½
26°, 800 lb drs, delv ....lb.	.02½	.03	.02½	.03	.02½	.03
Aqua 26° tks NH ....cont.	...	.05	...	.05	...	.05
tk wagon ....lb.	...	.024	...	.024	...	...
Ammonium Acetate, kgs ..lb.	.26	.33	.26	.33	.26	.33
Bicarbonate, bbls, f.o.b. plant ....100 lb.	5.15	5.71	5.15	5.71	5.15	5.71
Bifluoride, 300 lb bbls...lb.	.15	.17	.15	.17	.15	.17
carbonate, tech, 500 lb bbls ....lb.	.08	.12	.08	.12	.08	.12
Chloride, White, 100 lb bbls, wks ....100 lb	4.45	4.90	4.45	4.90	4.45	5.25
Gray, 250 lb bbls wks...lb.	5.00	5.75	5.00	5.75	5.00	5.75
Lump, 500 lbs cks spot lb.	.10½	.11	.10½	.11	.10	.11
Lactate, 500 lb bbls ...lb.	.15	.16	.15	.16	.15	.16
Linoleate ....lb.	.11	.12	.11	.12	.11	.12
Nitrate, tech, cks ....lb.	.04	.05	.04	.05	.03¾	.05
Oleate, drs ....lb.	...	.10	...	.10	...	.10
Oxalate, neut, cryst, powd, bbls ....lb.	.26	.27	.26	.27	.26	.27
pure, cryst, bbls, kgs..lb.	.27	.28	.27	.28	.27	.28
Serchlorate, kgs ....lb.	...	.16	...	.16	.16	.16
Persulfate, 112 lb kgs ..lb.	.22½	.25	.22½	.25	.20	.25
Phosphate, dibasic tech, powd, 325 lb bbls ....lb.	.08	.10	.08	.10	.08	.11½
Sulfate, dom, f.o.b., bulk.ton	...	24.00	...	24.00	22.00	25.00
200 lb bgs ....ton	...	25.80	...	25.80	...	25.80
100 lb bgs ....lb.	...	26.50	...	26.50	...	26.50
Sulfocyanide, kgs ......lb.	...	.50	...	.50	...	.50
Amyl Acetate (from pentane)						
tks delv ....lb.	...	.13½	...	.13½	...	.13½
tech, drs, delv ....lb.	.142	.149	.142	.149	.142	.149
secondary, tks, delv ..lb.	...	.108	...	.108	.09	.108
c-l, drs, delv ....lb.	.118	.123	.118	.123	...	.123
Alcohol, see Alcohol, Amyl, also Fusel Oil.						

g Grain alcohol 20c a gal. higher in each case.

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Amyl Chloride, norm drs, wks lb.	.56	.68	.56	.68	.56	.68
Chloride, mixed, drs, wks ....lb.	.07	.077	.07	.077	.07	12.2
tks, wks ....lb.	...	.06	...	.06	.06	10.5
Lactate, drs, wks ......lb.	...	.50	...	.50	...	.50
Mercaptan, drs, wks ....lb.	...	1.10	...	1.10	...	1.10
Stearate, drs, wks ......lb.	...	.31	...	.31	...	.31
Amylene, drs, wks ....lb.	.102	.11	.102	.11	.10	.11
tks, wks ....lb.	...	.09	...	.09	...	.09
Aniline Oil, 960 lb drs and tks lb.	.15	.17½	.15	.17½	.15	.17½
Annatto fine ....lb.	.34	.37	.34	.37	.34	.37
Anthracene, 80% ....lb.	...	.75	...	.75	...	.75
40% ....lb.	...	.18	...	.18	...	.18
Anthraquinone, sublimed, 125 lb bbls ....lb.	.50	.52	.50	.52	.45	.50
Antimony, metal slabs, ton lots ....lb.	.13½	.15	.14½	.15	.07	.14½
Needle, powd, bbls .....lb.	.11½	.13½	.09	.13½	.07	.09
Butter of, see Chloride.						
Chloride, soln cbys .....lb.	.13	.17	.13	.17	.13	.17
Oxide, 500 lb bbls ......lb.	.11	.13	.10¼	.13	.08	.11
Salt, 63% to 65%, tins..lb.	.22	.24	.22	.24	.22	.24
Sulfuret, golden, bbls ...lb.	.22	.23	.19	.23	.16	.23
Vermilion, bbls ....lb.	.35	.42	.35	.42	.35	.42
Archil, conc, 600 lb bbls ..lb.	.21	.27	.21	.27	.21	.27
Double, 600 lb bbls .....lb.	.18	.20	.18	.20	.18	.20
Triple, 600 lb bbls .....lb.	.18	.20	.18	.20	.18	.20
Arglos, 80%, casks ......lb.	.15	.16	.15	.16	.15	.16
Crude, 30%, casks .....lb.	.07	.08	.07	.08	.07	.09
Aroclors, wks ....lb.	.18	.30	.18	.30	.18	.30
Arrowroot, bbl ....lb.	.08¾	.09¼	.08¾	.09¾	.08¾	.09¼
Arsenic, Red, 224 lb cs kgs lb.	...	.15¾	...	.15¾	.14	.15¾
White, 112 lb kgs ......lb.	.03½	.04½	.03½	.04½	.03½	.05
Metal ....lb.	.40	.42	.40	.42	.40	.45
Asbestine, c-l wks ....ton	13.00	15.00	13.00	15.00	13.00	15.00
Barium Carbonate precip, 200 lb bgs, wks ......ton	56.50	61.00	56.50	61.00	56.50	61.00
Nat (witherite) 90% gr, c-l, wks, bgs ....ton	42.00	45.00	42.00	45.00	42.00	45.00
Chlorate, 112 lb kgs NY lb.	.14	.16	.14	.16	.14	.16
Chloride, 600 lb bbl wks ton	72.00	74.00	72.00	74.00	72.00	74.00
Dioxide, 88%, 690 lb drs lb.	.11	.12	.11	.12	.11	.13
Hydrate, 500 lb bbls ....lb.	.05½	.06	.05½	.06	.04¾	.06
Nitrate, 700 lb cks .....lb.	...	.08¼	...	.08¼	...	.08¼
Barytes, floated, 350 lb bbls wks ....ton	23.00	30.50	23.00	30.50	23.00	30.50
Bauxite, bulk, mines .....ton	7.00	10.00	7.00	10.00	5.00	10.00
Benzaldehyde, tech, 945 lb drs, wks ....lb.	.60	.62	.60	.62	.60	.65
Benzene (Benzol), 90%, Ind, 8000 gal tks, frt allowed ....gal.	...	.15	...	.15	.15	.20½
90% c-l, drs ....gal.	...	.24	...	.24	...	.24
Ind Pure, tks, frt allowed ....gal.	...	.15	...	.15	.15	.20½
Benzidine Base, dry, 250 lb bbls ....lb.	.67	.69	.67	.69	.67	.69
Benzoyl Chloride, 500 lb drs lb.	.40	.45	.40	.45	.40	.45
Benzyl Chloride, tech, drs..lb.	.30	.40	.30	.40	.30	.40
Beta-Naphthol, 250 lb bbl, wks ....lb.	...	.24	...	.24	...	.24
Naphthylamine, sublimed, 200 lb bbls ....lb.	1.25	1.35	1.25	1.35	1.25	1.35
Tech, 200 lb bbls ....lb.	.53	.55	.53	.55	.53	.58
Bismuth metal	1.10	1.20	1.10	1.20	1.10	1.30
Chloride, boxes ....lb.	3.20	3.25	3.20	3.25	...	...
Hydroxide, boxes ......lb.	3.15	3.20	3.15	3.20	...	...
Oxychloride, boxes .....lb.	2.95	3.00	2.95	3.00	...	...
Subbenzoate, boxes .....lb.	3.25	3.30	3.25	3.30	...	...
Subcarbonate, kgs ......lb.	1.55	1.65	1.55	1.70	...	...
Trioxide, powd, boxes ..lb.	3.45	3.50	3.45	3.50	...	...
Subnitrate	1.40	1.45	1.40	1.45	1.40	1.60
Blackstrap, cane (see Molasses, Blackstrap).						
Blanc Fixe, 400 lb bbls, wks ....ton *h*	42.50	70.00	42.50	70.00	42.50	70.00
Bleaching Powder, 800 lb drs c-l wks contract...100 lb.	...	1.90	...	1.90	...	1.90
lcl, drs, wks ....lb.	2.15	3.50	2.15	3.50	2.00	3.50
Blood, dried, f.o.b., NY..unit	...	3.20	2.75	3.25	2.40	3.25
Chicago, high grade ...unit	...	2.75	2.75	3.75	2.00	3.10
Imported shipt ....unit	...	2.80	2.80	3.10	2.75	3.20
Blues, Bronze Chinese Milori Prussian Soluble .....lb.	.36½	.38	.36½	.38	.35½	.38
Bone, 4½ + 50% raw, Chicago ....ton	19.00	20.00	19.00	20.00	19.00	25.00
Bone Ash, 100 lb kgs .....lb.	.06	.07	.06	.07	.06	.07
Black, 200 lb bbls ......lb.	.05½	.08¼	.05½	.08¼	.05½	.08¼
Meal, 3% & 50%, imp..ton	...	24.00	23.00	24.00	16.00	24.00
Domestic, bgs, Chicago..ton	16.50	17.00	16.00	18.00	...	...
Borax, tech, gran, 80 ton lots, sacks, delv ....ton *i*	...	36.00	...	36.00	36.00	36.00
bbls, delv ....ton *i*	...	46.00	...	46.00	46.00	46.00
c-l, sacks, delv ....ton *i*	...	40.00	...	40.00	40.00	40.00
c-l, bbls, delv ....ton *i*	...	50.00	...	50.00	50.00	50.00
Tech, powd, 80 ton lots, sacks ....ton *i*	...	41.00	...	41.00	41.00	41.00
bbls, delv ....ton *i*	...	51.00	...	51.00	51.00	51.00
c-l, sacks, delv ....ton *i*	...	45.00	...	45.00	45.00	45.00
c-l, bbls, delv ....ton *i*	...	55.00	...	55.00	55.00	55.00
Bordeaux Mixture, jobbers, East, c-l, tins, drs, cases lb.	.08	.16	.08	.16	...	.16
Jobbers, West, c-l ......lb.	.08	.10	.08	.10	...	.10
Dealers, East, c-l ......lb.	.08½	.16½	.08½	.16½	...	.16½
Dealers, West, c-l ......lb.	.09	.11	.09	.11	...	.11

h Lowest price is for pulp, highest for high grade precipitated; *i* Crystals $6 per ton higher; USP, $15 higher in each case.

Prices

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Bromine, cases ....lb.	.30	.43	.30	.43	.30	.43
Bronze, Al, pwd, 300 lb drs lb.	.80	1.50	.80	1.50	.80	1.50
Gold, blk ....lb.	.40	.55	.40	.55	.40	.55
Butanes, com 16-32° group 3 tks ....lb.	...	.04	...	.04	.02¾	.04
Butyl, Acetate, norm drs, frt allowed ....lb.	.13	.13½	.13	.13½	.11	.14
tks, frt allowed ....lb.	.12	.13	.12	.13	.10	.13
Secondary tks, frt allowed lb.	..	.096	...	.096	.08	.096
drs, frt, allowed ......lb.	.106	.111	.106	.111	...	.111
Aldehyde, 50 gal drs wks lbs.	.19	.21	.19	.21	.19	.36
Secondary, drs ....lb.	.60	.75	.60	.75	.60	.75
Carbinol, norm drs, wks lb.	.60	.75	.60	.75	.60	.75
Lactate drs ....lb.	.22½	.23½	.22½	.23½	.22½	.29
Propionate, drs ....lb.	.18	.18½	.18	.18½	.17	.22
tks, delv ....lb.	...	.17	...	.17	...	.17
Stearate, 50 gal drs ....lb.	...	.26	...	.26	.25	.26
Tartrate, drs ....lb.	.55	.60	.55	.60	.55	.60
Cadmium, Sulfide, boxes...lb.	.75	.85	.75	.85	.65	.85
Cadmium Metal ....lb.	.65	.70	.55	.70	.55	.65
Calcium, Acetate, 150 lb bgs c-l, delv ....100 lb.	...	2.10	2.00	2.10	2.00	3.00
Arsenate, jobbers, East of Rocky Mts, drs ......lb.	.06	.06½	.06	.06½	...	...
dealers, drs ....lb.	.06¼	.07½	.06¼	.07½	...	...
South, jobbers, drs .....lb.	.06	.06½	.06	.06½	...	...
dealers, drs ....lb.	.06½	.06¾	.06¼	.06¾	...	...
Carbide, drs ....lb.	.05	.06	.05	.06	.05	.06
Carbonate, tech, 100 lb bgs c-l ....lb.	1.00	1.00	1.00	1.00	1.00	1.00
Chloride, flake, 375 lb drs c-l wks ....ton	...	19.50	...	19.50	...	19.50
Solid, 650 lb drs c-l f.o.b. wks ....ton	...	17.50	...	17.50	...	17.50
Ferrocyanide, 350 lb bbls wks ....lb.	...	.17	...	.17	...	.17
Gluconate, tech, 125 lb bbls ....lb.	...	.28	...	.28	.25	.28
Nitrate, 100 lb bgs ....ton	...	26.50	...	26.50	...	26.50
Palmitate, bbls ....lb.	.21	.22	.20	.22	.19	.20
Peroxide, 100 lb drs ....lb.	...	1.25	...	1.25	...	1.25
Phosphate, tech, 450 lb bbls ....lb.	.07½	.08	.07½	.08	.07½	.08
Resinate, precip, bbls ...lb.	.13	.14	.13	.14	.13	.14
Stearate, 100 lb bbls....lb.	.18	.20	.17	.20	.17	.19
Camphor, slabs ....lb.	.49	.50	.49	.52	.51	.59
Powder ....lb.	.49	.50	.50	.52	.51	.59
Camwood, Bk, ground bbls lb.	.16	.18	.16	.18	.16	.18
Carbon, Decolorizing, drs c-l ....lb.	.08	.15	.08	.15	.08	.15
Black, c-l, bgs, delv, price varying with zone ....lb.	.0445	.0535	.0445	.0535	.0445	.0535
lcl, bgs, delv, all zones lb.	...	.07	...	.07	.06½	.07
cartons, delv ....lb.	...	.07¾	...	.07¾	...	.07¾
cases, delv ....lb.	...	.08¼	...	.08¼	...	.08¼
Bisulfide, 500 lb drs....lb.	.05¼	.08	.05¼	.08	.05½	.08
Dioxide, Liq 20-25 lb cyl lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, 1400 lb drs, delv ....lb.	.05¼	.06	.05¼	.06	.05¼	.06
Casein, Standard, Dom grd lb.	.12¼	.14¾	.09½	.15	.09¼	.13
80-100 mesh, c-l, bgs ....lb.	.12¾	.15¾	.10	.16	.10	.14
Castor Pomace, 5½ NH_3, cl, bgs, wks ....ton	...	17.50	17.50	18.50	...	...
Imported, ship, bgs ....ton	...	18.75	18.75	20.00	...	...
Celluloid, Scraps, ivory cs lb.	.17	.18	.17	.18	.13	.18
Transparent, cs ....lb.	...	.20	...	.20	.16	.20
Cellulose, Acetate, 50 lb kgs ....lb.	.55	.60	.55	.60	.55	.90
Chalk, dropped, 175 lb bbls lb.	.03	.03¾	.03	.03¾	.03	.03¾
Precip, heavy, 560 lb cks lb.	.03	.04	.03	.04	.03	.04
Light, 250 lb cks ....lb.	.03	.04	.03	.04	.03	.04
Charcoal, Hardwood, lump, blk, wks ....bu.	...	.15	...	.15	.12	.18
Willow, powd, 100 lb bbl wks ....lb.	.06	.06¼	.06	.06¼	.06	.06¼
bgs, delv ....ton	25.00	30.00	25.00	30.00	...	...
Chestnut, clarified bbls wks lb.	...	.01⅞	...	.01⅞	.01⅝	.01⅞
25% tks wks ....lb	...	.01½	...	.01½	.01¼	.01½
Pwd, 60%, 100 lb bgs, wks ....lb.	..	.04⅞	...	.04⅞	...	.04⅞
China Clay, c-l, blk mines ton	...	7.00	...	7.00	7.00	9.00
Powdered, bbls ....lb.	.01	.02	.01	.02	.01	.02
Pulverized, bbls wks ...ton	10.00	12.00	10.00	12.00	10.00	12.00
Imported, lump, blk ...ton	15.00	25.00	15.00	25.00	15.00	25.00
Chlorine, cyls, lcl, wks contract ....lb.	.07½	.08½	.07½	.08½	.07	.08½
cyls, c-l, contract ...lb. *j*	...	.05½	...	.05½	...	.05½
Liq tk wks contract..100 lb.	...	2.00	...	2.00	1.85	2.00
Multi c-l cyls wks cont..lb.	2.15	2.40	2.15	2.40	2.00	2.40
Chloroacetophenone, tins, wks ....lb.	...	2.00	...	2.00	...	...
Chlorobenzene, Mono, 100 lb drs, lc-l, wks ....lb.	.06	.07½	.06	.07½	.06	.07½
Chloroform, tech, 1000 lb drs ....lb.	.20	.21	.20	.21	.20	.21
USP, 25 lb tins ....lb.	.30	.31	.30	.31	.30	.35
Chloropicrin; comml cyls..lb.	.85	.90	.85	.90	.85	1.25
Chrome, Green, CP ......lb.	.17	.18½	.17	.30	.20	.30
Yellow ....lb.	.14	.16	.14	.16	.15	.16
Chromium, Acetate, 8% Chrome bbls ....lb.	.05	.05¾	.05	.05¾	.05	.05¾
20° soln, 400 lb bbls ...lb.	...	.05½	...	.05½	...	.05½
Fluoride, powd, 400 lb bbl ....lb.	.27	.28	.27	.28	.27	.28

j A delivered price.

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Coal tar, bbls ....bbl.	7.25	9.00	7.25	9.00	7.25	9.00
Cobalt Acetate, bbls ....lb.	...	.60	...	.60	.60	.80
Carbonate tech, bbls ....lb.	1.35	1.40	1.35	1.40	1.34	1.40
Hydrate, bbls ....lb.	1.66	1.76	1.66	1.76	1.66	1.76
Linoleate, paste, bbls ...lb.	...	.30	...	.30	.30	.40
Resinate, fused, bbls ...lb.	...	.12½	...	.12½	...	.12½
Precipitated, bbls ......lb.	...	.32	...	.32	.32	.42
Cobalt Oxide, black, bgs ..lb.	1.25	1.35	1.25	1.35	1.25	1.35
Cochineal, gray or bk bgs lb.	.34	.39	.34	.39	.33	.42
Teneriffe silver, bgs ....lb.	.35	.40	.35	.40	.34	.43
Copper, metal, electrol 100 lb.	...	9.00	...	9.00	7.87½	9.00
Carbonate, 400 lb bbls ..lb.	...	.08¼	...	.08¼	...	.08¼
52-54% bbls ....lb.	.14½	.16¼	.14½	.16¼	.15½	.16
Chloride, 250 lb bbls ...lb.	.17	.18	.17	.18	.17	.18
Cyanide, 100 lb drs ....lb.	.37	.38	.37	.38	.37	.40
Oleate, precip, bbls .....lb.	...	.20	...	.20	...	.20
Oxide, red, 100 lb bbls ..lb.	.15	.17	.15	.17	.12½	.17
black bbls, wks ......lb.	.14½	.15	.14	.16½	...	...
Resinate, precip, bbls ...lb.	.18	.19	.18	.19	.18	.19
Stearate, precip, bbls .. lb.	.35	.40	.35	.40	.35	.40
Sub-acetate verdigris, 400 lb bbls ....lb.	.18	.19	.18	.19	.18	.19
Sulfate, bbls c-l wks 100 lb.	...	3.85	...	3.85	3.75	3.85
Copperas, crys and sugar bulk c-l, wks, bgs ....ton	12.00	13.00	12.00	13.00	12.00	14.50
Corn Syrup, 42 deg, bbls ....100 lb.	...	3.63	3.49	3.63	3.04	3.59
43 deg, bbls ......100 lb.	...	3.68	3.54	3.68	3.09	3.64
Corn Sugar, tanners, bbls ....100 lbs.	...	3.56	3.46	3.66	...	...
Cotton, Soluble, wet, 100 lb bbls ....lb.	.40	.42	.40	.42	.40	.42
Cream Tartar, USP, powd & gran, 300 lb bbls .....lb.	...	.16¾	.16¼	.17¼	.17½	.19½
Creosote, USP, 42 lb cbys lb.	.45	.47	.45	.47	.45	.47
Oil, Grade 1, tks ......gal.	.11½	.12½	.11½	.12½	.10	.12½
Grade 2 ....gal.	.10½	.11½	.10½	.11½	.10½	.12
Cresol, USP, drs ....lb.	.11	.11½	.11	.11½	.11	.11½
Crotonaldehyde, 98% 50 gal drs ....lb.	.32	.36	.32	.36	.26	.36
Cudbear, English ....lb.	.19	.25	.19	.25	.19	.25
Philippine, 100 lb bale ..lb.	.03¾	.04¾	.03½	.04¾	.03½	.04¾
Cyanamid, bags c-l frt allowed Ammonia unit	...	1.07½	...	1.07½	...	1.07½
Dextrin, corn, 140 lb bgs f.o.b., Chicago ...100 lb.	..	4.05	3.95	4.15	3.50	4.20
British Gum, bgs ...100 lb.	4.30	4.50	4.20	4.50	3.75	4.60
White, 140 lb bgs ..100 lb.	4.00	4.10	3.90	4.10	3.47	4.20
Potato, Yellow, 220 lb bgs ....lb.	.07¾	.08¾	.07¾	.08¾	.07¾	.08¾
White, 220 lb bgs, lcl ...lb.	.08	.09	.08	.09	.08	.09
Tapioca, 200 bgs, lcl ....lb.	...	.08	.08	.08¾	.06¾	.08¾
Diamylamine, drs, wks ....lb.	...	1.00	...	1.00	...	1.00
Diamylene, drs, wks ......lb.	.095	.102	.095	.102	.09	.102
tks, wks ....lb.	...	.08½	...	.08½	...	.08½
Diamylether, wks, drs ....lb.	.085	.092	.085	.092	.09	.77
tks, wks ....lb.	...	.075	...	.075	...	...
Diamylphthalate, drs wks gal.	.18	.19½	.18	.20½	...	.20½
Diamyl Sulfide, drs, wks lb.	...	1.10	...	1.10	..	1.10
Dianisidine, bbls ....lb.	2.25	2.45	2.25	2.45	2.35	2.45
Dibutylphthalate, drs, wks lb.	.20	.21	.20	.23	.20½	.21
Dibutyltartrate, 50 gal drs lb.	.29½	.31½	.29½	.31½	.29½	.31½
Dichlorethylene, drs .....gal.	.29	...	.29	...	.29	...
Dichloroethylether, 50 gal drs, wks ....lb.	.16	.17	.16	.17	.16	.21
tks, wks ....lb.	...	.15	...	.15	...	.15
Dichloromethane, drs, wks lb.	...	.23	.15	.23	...	.15
Dichloropentanes, drs, wks lb.	.032	.040	.032	.040	.0278	.040
tks, wks ....lb.	...	.02½	...	.02½	...	.02½
Diethanolamine, tks ......lb.	...	.30	...	...	...	...
Diethylamine, 400 lb drs ..lb.	2.75	3.00	2.75	3.00	2.75	3.00
Diethyl Carbinol, drs .....lb.	.60	.75	.60	.75	.60	.75
Diethylcarbonate, com drs lb.	.31⅜	.35	.31⅜	.35	.31⅜	.35
90% grade, drs ......lb.	...	.25	...	.25	...	.25
Diethylaniline, 850 lb drs..lb.	.52	.55	.52	.55	.52	.55
Diethylorthotoluidin, drs ..lb.	.64	.67	.64	.67	.64	.67
Diethyl phthalate, 1000 lb drs ....lb.	.18½	.19	.18½	.27	.26	.27
Diethylsulfate, tech, 50 gal drs ....lb.	...	...	...	...	...	...
Diethyleneglycol, drs .....lb.	.15½	.17½	.15½	.17½	.14	.16
Mono ethyl ethers, drs..lb.	.15	.17	.15	.17	.15	.17
tks, wks ....lb.	...	.15	...	.15	...	...
Mono butyl ether, drs ..lb.	...	.26	...	.26	...	.26
Diethylene oxide, 50 gal drs wks ....lb.	.20	.24	.20	.27	.26	.27
Diglycol Oleate, bbls .....lb.	.16	.24	.16	.24	.16	.18
Dimethylamine, 400 lb drs, pure 25 & 40% sol 100% basis .... lb.	...	.95	...	.95	.95	1.20
Dimethylaniline, 340 lb drs lb.	.29	.30	.29	.30	.29	.30
Dimethyl Ethyl Carbinol, drs .... lb.	.60	.75	.60	.75	.60	.75
Dimethyl phthalate, drs ...lb.	.20	.21½	.20½	.24½	.24	.24½
Dimethysulfate, 100 lb drs lb.	.45	.50	.45	.50	.45	.50
Dinitrobenzene, 400 lb bbls ....lb. *k*	.17	.19½	.17	.19½	.17	.19½
Dintrochlorobenzene, 400 lb bbls ....lb.	.14	.15½	.14	.15½	.14	.15½
Dinitronaphthalene, 350 lb bbls ....lb.	.34	.37	.34	.37	.34	.37
Dinitrophenol, 350 lb bbls lb.	.23	.24	.23	.24	.23	.24
Dinitrotoluene, 300 lb bbls lb.	.15½	.16½	.15½	.16½	.15½	.16½
Diphenyl ....lb.	.15	.25	.15	.25	.15	.25
Diphenylamine ....lb.	.31	.32	.31	.32	.31	.34
Diphenylguanidine, 100 lb bbl ....lb.	.36	.37	.36	.37	.36	.37

k Higher price is for purified material.

Prices

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Dip Oil, see Tar Acid Oil.						
Divi Divi pods, bgs shipmt. ton	36.00	40.00	36.00	40.00	35.00	40.00
Extract ....lb.	.05	.05½	.05	.05½	.05	.05½
Egg Yolk, 200 lb. cases ...lb.	...	.59	.46	.59	.40	.54
Epsom Salt, tech, 300 lb bbls c-l NY ....100 lb.	1.80	2.00	1.80	2.25	2.20	2.25
USP, c-l, bbls .....100 lb.	...	2.00	2.00	2.25	2.25	2.25
Ether, USP anaesthesia 55 lb drs ....lb.	.22	.23	.22	.23	.22	.24
(Conc) ....lb.	.09	.10	.09	.10	.09	.10
Ether, Isopropyl 50 gal drs lb.	.07	.08	.07	.08	.07	.08
tks, frt allowed ......lb.	...	.06	...	.06	...	...
Nitrous, conc, bottles ...lb.	.75	.77	.75	.77	.75	.77
Synthetic, wks, drs ....lb.	.08	.09	.08	.09	.08	.09
Ethyl Acetate, 85% Ester tks ....lb.	.07½	.08	.07½	.08	.07½	.08
drs ....lb.	.08½	.09	.08½	.09	.08½	.09
Anhydrous, tks ....lb.	...	.08½	...	.08½	.08½	.10
drs ....lb.	.09½	.10	.09½	.10	.09½	.10¼
Acetoacetate, 50 gal drs lb.	.65	.68	.65	.68	.65	.68
Benzylaniline, 300 lb drs lb.	.88	.90	.88	.90	.88	.90
Bromide, tech, drs .....lb.	.50	.55	.50	.55	.50	.55
Chloride, 200 lb drs ....lb.	.22	.24	.22	.24	.22	.24
Chlorocarbonate cbys ...lb.	...	.30	...	.30	...	.30
Crotonate, drs ....lb.	1.00	1.25	1.00	1.25	1.00	1.25
Ether, Absolute, 50 gal drs ....lb.	.50	.52	.50	.52	.50	.52
Lactate, drs, wks ......lb.	.25	.29	.25	.29	.25	.33
Methyl Ketone, 50 gal drs, frt allowed ....lb.	.08½	.09	.08½	.09	.08½	.09
tks, frt allowed ......lb.	...	.07½	...	.07½	...	...
Oxalate, drs, wks ......lb.	.37½	.55	.37½	.55	.37½	.55
Oxybutyrate, 50 gal drs wks ....lb.	.30	.30½	.30	.30½	.30	.30½
Ethylene Dibromide, 60 lb drs ....lb.	.65	.70	.65	.70	.65	.70
Chlorhydrin, 40%, 10 gal cbys chloro, cont .....lb.	.75	.85	.75	.85	.75	.85
Dichloride, 50 gal drs ..lb.	.0545	.0994	.0545	.0994	.0545	.09
Glycol, 50 gal drs, wks lb.	.17	.21	.17	.28	.26	.28
tks, wks ....lb.	...	.16	...	...	...	...
Mono Butyl Ether, drs, wks	.20	.21	.20	.21	.20	.21
tks, wks ....lb.	...	.19	...	.19	.19	.19
Mono Ethyl Ether, drs, wks	.16	.17	.16	.17	.15	.17
tks, wks ....lb	...	.15	...	.15	.15	.15
Mono Ethyl Ether Acetate, drs, wks	.17½	.18½	.17½	.18½	.16½	.18½
tks, wks ....lb.	...	.16½	...	.16½	.16½	.16½
Mono, Methyl Ether, drs wks ....lb.	.19	.23	.19	.23	.21	.23
tks, wks ....lb.	...	.18	...	...	...	...
Stearate	.18	.18	.18	.18	.18	.18
Oxide, cyl ....lb.	...	.75	...	.75	...	.75
Ethylidenaniline ....lb.	.45	.47½	.45	.47½	.45	.47½
Feldspar, blk pottery .....ton	...	14.50	...	14.50	...	14.50
Powd, blk, wks ....ton	14.00	14.50	14.00	14.50	13.50	14.50
Ferric Chloride, tech, crys, 475 lb bbls ....lb.	.05	.07½	.05	.07½	.05	.07½
sol, cbys ....lb.	.06¼	.06½	.06¼	.06½	...	...
Fish Scrap, dried, unground, wks ....unit *l*	2.85	2.90	2.50	2.90	2.25	2.60
Acid, Bulk, 6 & 3%, delv Norfolk & Baltimore basis ....unit *m*	...	2.25	2.00	2.25	2.00	2.50
Fluorspar, 98%, bgs	28.00	35.50	28.00	35.50	28.00	35.50
Formaldehyde, USP, 400 lb bbls, wks ....lb.	.06	.07	.06	.07	.06	.07
Fossil Flour ....lb.	.02½	.04	.02½	.04	.02½	.04
Fullers Earth, blk, mines ....ton	6.50	15.00	6.50	15.00	6.50	15.00
Imp powd, c-l, bgs .....ton	23.00	30.00	23.00	30.00	23.00	30.00
Furfural (tech) drs, wks lb.	.10	.15	.10	.15	.10	.15
Furfuramide (tech) 100 lb drs ....lb.	...	.30	...	.30	...	.30
Fusel Oil, 10% impurities lb.	.16	.18	.16	.18	.16	.18
Fustic, chips ....lb.	.04	.05	.04	.05	.04	.05
Crystals, 100 lb boxes ..lb.	.20	.23	.20	.23	.20	.23
Liquid 50°, 600 lb bbls..lb.	.08½	.12	.08½	.12	.08½	.12
Solid, 50 lb boxes ......lb.	.16	.18	.16	.18	.16	.18
Sticks ....ton	25.00	26.00	25.00	26.00	25.00	26.00
G Salt paste, 360 lb bbls ..lb.	.42	.43	.42	.43	.42	.43
Gall Extract ....lb.	.18	.20	.18	.20	.18	.20
Gambier, com 200 lb bgs ..lb.	...	.06	.05	.08	.04	.08
Singapore cubes, 150 lb bgs ....100 lb.	.08	.09	.07⅛	.09⅛	.05	.09⅛
Gelatin, tech, 100 lb cs ...lb.	.50	.55	.50	.55	.45	.55
Glauber's Salt, tech, c-l wks ....100 lb.	1.10	1.30	1.10	1.30	1.10	1.30
Anhydrous, see Sodium Sulfate.						
Glucose (grape sugar) dry 70-80° bgs, c-l, NY ..100 lb.	3.24	3.34	3.24	3.34	3.24	3.34
Tanner's Special, 100 lb. bgs ....100 lb.	...	2.33	...	2.33	...	2.33
Glue, bone, com grades, c-l bgs ....lb.	...	.08	...	.08	.07	.12½
Better grades, c-l, bgs lb.	.09	.09½	.09	.09½	.09½	.16
Casein, kgs ....lb.	.18	.22	.18	.22	.18	.22
Hide, high grd, c-l, bgs..lb.	.23	.28	.23	.28	.23	.28
Med grd, c-l, bgs .....lb.	.19	.23	.19	.23	.19	.23
Low grd, c-l, bgs .....lb.	.13½	.19	.13½	.19	.13½	.19
Glycerin, CP, 550 lb drs ..lb.	.14	.14½	.14	.14½	.11	.14½
Dynamite, 100 lb drs ...lb.	.13¾	.14¼	.13¾	.14¼	.10	.14¼
Saponification, drs .....lb.	.10½	.11	.10	.11	.06¾	.10½
Soap Lye, drs ....lb.	.09½	.10	.09	.10	.06¼	.09⅛

l + 10; *m* + 50.

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Glyceryl Phthalate .... lb.	...	.28	...	.28	...	.28
Glyceryl Stearate, bbls.... lb.	...	.18	...	.18	...	.18
Glycol Phthallate .... lb.	...	.29	.28	.29	...	.28
Glycol Stearate .... lb.	...	.23	.18	.23	.18	.20
Graphite,						
Crystalline, 500 lb bbls .... lb.	.04	.05	.04	.05	.04	.05
Flake, 500 lb. bbls ..... lb.	.08	.16	.08	.16	.08	.16
Amorphous, bbls .... lb.	.03	.04	.03	.04	.03	.04
GUMS						
Gum Aloes, Barbadoes .... lb.	.87	.90	.87	.90	.85	.90
Animi (Zanzibar) bean & pea, 250 lb cases .... lb.	.35	.40	.35	.40	.35	.40
Glassy, 250 lb cases .... lb.	.50	.55	.50	.55	.50	.55
Arabic, amber sorts ...... lb.	.11½	.14	.09½	.14	.07¾	.10⅝
White sorts, No. 1, bgs .... lb.	.21	.22	.21	.22	...	...
No. 2, bgs .... lb.	.19	.20	.19	.21	...	...
Powd, bbls .... lb.	.15½	.16½	.13½	.16½	...	...
Asphaltum, Barbadoes (Manjak) 200 lb bgs, f.o.b., NY .... lb.	.02½	.10½	.02½	.10½	.02½	.10½
Egyptian, 200 lb cases, f.o.b. NY .... lb.	.12	.15	.12	.15	.12	.15
California, f.o.b. NY, drs .... ton	29.00	55.00	29.00	55.00	...	...
Benzoin Sumatra, USP, 120 lb cases .... lb.	.22	.23	.20	.28	.18½	.23
Copal Congo, 112 lb bgs, clean, opaque .... lb.	.21¾	.22¼	.21¾	.24⅝	.24⅛	.28
Dark, amber .... lb.	.08⅜	.08⅞	.08⅜	.09¼	.08⅝	.10½
Light, amber .... lb.	.12½	.13	.12	.14⅞	.14⅜	.19
Copal, East India 180 lb bgs						
Macassar pale bold .... lb.	.09⅞	.10⅜	.09⅞	.10¾	.09⅞	.10½
Chips .... lb.	.05½	.06	.05½	.06	...	...
Nubs .... lb.	.08½	.09	.08½	.09	...	...
Dust .... lb.	.04	.04½	.03¾	.04½	...	...
Singapore						
Bold .... lb.	.16	.16½	.16	.17	.16	.17
Chips .... lb.	.04⅝	.05⅛	.04⅝	.05⅛	...	...
Nubs .... lb.	.10	.10½	.10	.11	...	...
Dust .... lb.	.04	.04½	.03¾	.04½	...	...
Copal Manilla, 180-190 lb baskets, Loba A ..... lb.	.11¾	.12¼	.11¾	.12¼	.11⅜	.14½
Loba B .... lb.	.10¾	.11¼	.10¼	.11¼	.10¼	.13½
Loba C .... lb.	.10⅛	.11⅜	.10⅛	.11⅜	.09¾	.12
MA sorts .... lb.	.06	.06½	.06	.07¼	.06½	.07½
DBB .... lb.	.08¼	.08¾	.08	.08¼	.08	.09½
Dust .... lb.	.04⅞	.05⅜	.04⅞	.05⅜	...	...
Copal Pontianak, 224 lb cases, bold genuine .... lb.	.14⅜	.14⅞	.14⅜	.16⅝	.16⅛	.19
Mixed .... lb.	.12⅞	.13⅜	.12⅞	.14½	...	...
Chips .... lb.	.06⅞	.07¾	.06⅞	.07⅞	...	...
Nubs .... lb.	.09⅝	.10⅛	.09⅝	.10¾	...	...
Split .... lb.	.12⅞	.13⅜	.13⅞	.13⅜	...	...
Dammar Batavia, 136 lb cases						
A .... lb.	.19	.19½	.19	.20¼	...	...
B .... lb.	.18	.18½	.18	.19¼	...	...
C .... lb.	.16	.16½	.16	.17¼	...	...
D .... lb.	.13½	.13⅞	.11¾	.13⅞	...	...
A/D .... lb.	.15½	.16	.14	.16	...	...
A/E .... lb.	.12	.12½	.11¾	.12½	...	...
E .... lb.	.06¾	.07¼	.07	.07¼	.07	.09½
F .... lb.	.06½	.06⅝	.06⅛	.06⅝	.05½	.06⅝
Singapore						
No. 1 .... lb.	.15⅝	.16⅛	.15⅝	.17	.15½	.18
No. 2 .... lb.	.10⅝	.11⅝	.10⅝	.11⅝	.09⅜	.11
No. 3 .... lb.	.04⅞	.05⅞	.04⅝	.05⅞	.05⅛	.07
Chips .... lb.	.08⅞	.09¾	.08⅞	.09¾	.09	.10¼
Dust .... lb.	.06¼	.06¾	...	05¾	.05	.06
Seeds .... lb.	.04¾	.05¼	.04¾	.07¼	.06	.07¾
Ester .... lb.	.07⅝	.08⅜	.07¼	.08⅜	...	...
Gamboge, pipe, cases ..... lb.	.57	.58	.57	.65	.57	.65
Powdered, bbls .... lb.	.65	.70	.65	.75	.67	.75
Ghatti, sol. bgs .... lb.	.11	.15	.09	.15	.09	.09½
Karaya, pow bbls xxx .... lb.	.24	.25	.23	.25	.23	.25
xx .... lb.	.16	.17	.15	.17	.15	.16
No. 1 .... lb.	.08	.09	.08	.09	.08	.11
No. 2 .... lb.	.07	.08	.07	.08	.07	.09
Kauri, NY, San Francisco,						
Brown XXX, cases .... lb.	.60	.60½	.60	.60½	...	...
BX .... lb.	.33	.33½	.33	.33½	...	...
B1 .... lb.	.19	.19½	.19	.19½	...	...
B2 .... lb.	.14½	.15	.14½	.15	...	...
B3 .... lb.	.12	.12½	.12	.12½	...	...
Pale XXX .... lb.	.65	.65½	.65	.65½	...	...
No. 1 .... lb.	.40	.40½	.40	.40½	...	...
No. 2 .... lb.	.22	.22½	.22	.22½	...	...
No. 3 .... lb.	.15	.15½	.15	.15½	...	...
Kino, tins .... lb.	.70	.80	.70	.80	.75	.80
Mastic .... lb.	.55	.55½	.46	.55½	.35	.55½
Sandarac, prime quality, 200 lb bgs & 300 lb cks ... lb.	.32½	.33	.32½	.35½	.35	.50
Senegal, picked bgs ...... lb.	.20	.21	.20	.21	17	.21
Sorts .... lb.	.11½	.12½	.09⅜	.12½	.08	.10
Thus, bbls .... 280 lbs.	...	11.00	10.50	11.00	9.50	10.75
Strained .... 280 lbs.	...	11.00	10.50	11.00	9.50	10.75
Tragacanth, No. 1, cases .... lb.	1.15	1.20	1.15	1.20	1.00	1.20
No. 2 .... lb.	1.05	1.10	1.05	1.10	...	...
No. 3 .... lb.	.95	1.00	.95	1.00	...	...
No. 4 .... lb.	.85	.90	.85	.90	...	...
No. 5 .... lb.	.75	.80	.75	.80	...	...
No. 6, bgs .... lb.	.14	.15	.14	.15	...	...
Sorts, bgs .... lb.	.11	.12	.11	.12	...	...
Yacca, bgs .... lb.	.03¼	.03¾	.03¼	.03¾	.03¼	.04

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Helium, cyl. (200 cu. ft.) cyl.	...	25.00	...	25.00	25.00	25.00
Hematite crystals, 400 lb bbls ....lb.	.16	.18	.16	.18	.16	.18
Paste, 500 bbls ....lb.	...	.11	...	.11	...	.11
Hemlock 25%, 600 lb bbls wks ....lb.	...	.02⅞	...	.02⅞	.02⅞	.04½
tks ....lb.	...	.02½	...	.02½	...	...
Hexalene, 50 gal drs wks..lb.	...	.30	...	.30	...	.30
Hexane, normal 60-70°C. Group 3, tks ....gal.	...	.14	...	.14	...	.14
Hexamethylenetetramine, drs ....lb.	.37	.39	.37	.39	.37	.39
Hexyl Acetate, delv drs ...lb.	.12	.12½	.12	.12½	.12	.12½
tks ....lb.	...	.11½	..	.11½	...	...
Hoof Meal, f.o.b. Chicago unit	...	2.50	2.50	2.70	1.85	2.70
South Amer. to arrive unit	...	1.85	...	1.85	1.65	1.80
Hydrogen Peroxide, 100 vol, 140 lb cbys ....lb.	.20	.21	.20	.21	.20	.21
Hydroxyamine Hydrochloride ....lb.	...	3.15	...	3.15	...	3.15
Hypernic, 51°, 600 lb bbls lb.	.17	.20	.17	.20	.17	.20
Indigo Madras, bbls ......lb.	1.25	1.30	1.25	1.30	1.25	1.30
20% paste, drs ....lb.	.15	.18	.15	.18	.15	.18
Synthetic, liquid ....lb.	...	.12	...	.12	...	.12
Iodine, crude ....per kilo	...	15s 1d	...	15s 1d	...	15s 1d
Resublimed, kgs ....lb.	...	1.90	...	1.90	1.90	2.30
Irish Moss, ord, bales ....lb.	.09	.10	.09	.10	.07	.10
Bleached, prime, bales ..lb.	.18	.19	.18	.19	.14	.19
Iron Acetate Liq. 17°, bbls lb.	.03	.04	.03	.04	.03	.04
Chloride see Ferric Chloride.						
Nitrate, coml, bbls ..100 lb.	2.75	3.25	2.75	3.25	2.75	3.25
Oxide, English ....lb.	.07½	.08¾	.07½	.08¾	.07½	.09
Isobutyl Carbinol (128-132°C) drs, wks ....lb.	.33	.34	.33	.34	.34	.34
tks, wks ....lb.	...	.32	...	.32	.32	.326
Isopropyl Acetate, tks ....lb.	...	.07½	...	.07½	.07	.07½
drs, frt allowed ....lb.	.08½	.09	.08½	.09	...	...
Ether, see Ether, isopropyl.						
Keiselguhr, 95 lb bgs, NY, Brown ....ton	60.00	70.00	60.00	70.00	60.00	70.00
Lead Acetate, brown, broken, f.o.b. NY, bbls ....lb.	...	.09½	...	.09½	.09½	.09½
White, broken, bbls ....lb.	...	.11	...	.11	.11	.11
cryst bbls ....lb.	...	.10½	...	.10½	.10½	.10½
gran, bbls ....lb.	...	.11	...	.11	.11	.11
powd, bbls ....lb.	...	.11¼	...	.11¼	.11¼	.11¼
Arsenate, East, jobbers, drs ....lb.	.09	.09½	.09	.09½	...	...
Dealers, drs ....lb.	.09¼	.10½	.09¼	.10½	...	...
West, jobbers, drs .....lb.	...	.09	...	.09	...	...
dealers, drs ....lb.	...	.10	...	.10	...	...
Linoleate, solid bbls ......lb.	.26	.26½	.26	.26½	.26	.26½
Metal, c-l, NY ......100 lb	...	3.75	3.50	3.75	3.50	4.25
Red, dry, 95% Pb_3O_4, delv ....lb.	.0625	.0725	.06	.0725	.06	.07¾
97% Pb_3O_4, delv .....lb.	.065	.075	.06¼	.075	...	...
98% Pb_3O_4, delv ....lb.	.0675	.07½	.06½	.0775	...	...
Nitrate, 500 lb bbls, wks..lb.	.10	.14	.10	.14	.10	.14
Oleate, bbls ....lb.	.15	.16	.15	.16	.15	.16
Resinate, precip, bbls ...lb.	...	.14	...	.14	.14	.18½
Stearate, bbls ....lb.	.22	.23	.22	.23	.22	.23
White, 500 lb bbls, wks..lb.	.06½	.07	.06½	.07	.06½	.07
Sulfate, 500 lb bbls, wks lb.	...	.06	...	.06	...	.06
Lime, chemical quicklime, f.o.b., wks, bulk .....ton	7.00	7.25	7.00	7.25	...	...
Hydrated, f.o.b., wks ..ton	8.50	12.00	8.50	12.00	...	...
Lime Salts, see Calcium Salts.						
Lime sulfur, sol, jobbers, tks ....gal.	...	.10	...	.10	...	...
drs ....gal.	.13½	.15½	.13½	.15½	...	...
Dealers, tks ....gal.	...	.10½	...	.10½	...	...
drs ....gal.	.14	.16½	.14	.16½	...	...
Linseed cake, bgs ....ton	...	27.00	27.00	37.50	21.50	37.50
Linseed Meal, bgs ....ton	...	28.00	28.00	40.00	30.50	41.00
Litharge, coml, delv, bbls..lb.	.0525	.06¼	.05	.06¼	.051	.06¾
Lithopone, dom, ordinary, delv, bgs ....lb.	.04½	.04¾	.04½	.04¾	.04½	.04¾
bbls ....lb.	.04¾	.05	.04¾	.05	.04¾	.05
High strength, bgs .....lb.	.06	.06¼	.06	.06¼	.06	.06¼
bbls ....lb.	.06¼	.06½	.06¼	.06½	.06¼	.06½
Titanated, bgs ....lb.	.06	.06¼	.06	.06¼	.06	.06¼
bbls ....lb.	.06¼	.06½	.06¼	.06½	.06¼	.06½
Logwood, 51°, 600 lb bbls lb.	.08½	.10½	.08½	.10½	.08½	.12½
Solid, 50 lb boxes ......lb.	.13½	.17½	.13½	.17½	.13½	.17½
Sticks ....ton	24.00	26.00	24.00	26.00	24.00	26.00
Madder, Dutch ....lb.	.22	.25	.22	.25	.22	.25
Magnesite, calc, 500 lb bbl ton	60.00	65.00	60.00	65.00	55.00	65.00
Magnesium Carb, tech, 70 lb bgs, wks ....lb.	.06	.06½	.06	.06½	.06	.06½
Chloride flake, 375 lb drs, c-l, wks ....ton	36.00	39.00	36.00	39.00	34.00	39.00
Magnesium fluosilicate, crys, 400 lb bbls, wks .....lb.	.10	.10½	.10	.10½	.10	.10½
Oxide, USP, light, 100 lb. bbls ....lb.	...	.42	...	.42	...	.42
Heavy, 250 lb bbls ...lb.	...	.50	...	.50	...	.50
Palmitate, bbls ....lb.	.23	.24	.22	.24	.21	.23
Stearate, bbls ....lb.	.20	.22	.19	.22	...	...
Linoleate, liq drs ......lb.	.18	.19	.18	.19	.18	.19
Resinate, fused, bbls ...lb.	.08¼	.08½	.08¼	.08½	.08¼	.08½
precip, bbls ....lb.	...	.12	...	.12	.11½	.12½
Manganese Borate, 30%, 200 lb bbls ....lb.	.15	.16	.15	.16	.15	.16
Chloride, 600 lb cks ....lb.	.09	.12	.09	.12	.07	.12
Dioxide, tech (peroxide), drs ....lb.	.03¾	.06	.03¾	.06	.03¾	.06
Mangrove 55%, 400 lb bbls lb.	...	.04	...	.04	...	.04
Bark, African ....ton	...	29.50	29.00	30.00	26.00	32.00
Marble Flour, blk ....ton	12.00	13.00	12.00	13.00	12.00	13.00
Mercuric chloride ....lb.	.71	.76	.71	.93	.73	.93

Current

Mercury
Orthodichlorobenzene

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Mercury metal ...76 lb. flasks	...	75.00	73.50	76.50	66.50	79.00
Meta-nitro-aniline ....lb.	.67	.69	.67	.69	.67	.69
Meta-nitro-paratoluidine 200 lb bbls ....lb.	1.40	1.55	1.40	1.55	1.40	1.55
Meta-phenylene-diamine 300 lb bbls ....lb.	.80	.84	.80	.84	.80	.84
Peroxide, 100 lb cs ....lb.	1.20	1.25	1.20	1.25	1.20	1.25
Silicofluoride, bbls .....lb.	.09	.10	.09	.10	.09	.11
Stearate, bbls ....lb.	.19	.20	.19	.20	.19	.20
Meta-toluene-diamine, 300 lb bbls ....lb.	.67	.69	.67	.69	.67	.69
Methanol, 95%, frt allowed, drs ....gal. *o*	.37½	.58	.37½	.58	.37½	.58
tks, frt allowed ....gal. *o*	.33	.36½	.33	.36½	.33	.36½
97% frt allowed, drs gal. *o*	.38½	.59	.38½	.59	.38½	.59
tks, frt allowed ....gal. *o*	.34	.37½	.34	.37½	.34	.37½
Pure, frt allowed, drs gal. *o*	.40	.61	.40	.61	.40	.61
tks, frt allowed ....gal. *o*	.35½	.39	.35½	.39	.35½	.39
Synthetic, frt allowed, drs ....gal. *o*	.40	.61	.40	.61	.40	.61
tks, frt allowed ....gal. *o*	.35½	.39	.35½	.39	.35½	.39
Methyl Acetate, dom, 98-100%, drs ....lb.	.18	.18½	.18	.18½	.18	.18½
Synthetic, 410 lb drs ...lb.	.16	.17	.16	.17	.16	.17
tks ....lb.	...	.15	...	.15	.15	.15
Acetone, frt allowed, drs ....gal. *p*	.49½	.68½	.49½	.73½	...	...
tks, frt allowed, drs gal. *p*	.44	...	.44	.52½	...	...
Synthetic, frt allowed, east of Rocky M., drs gal. *p*	.57½	.60	.57½	.60	.57½	.60
tks, frt allowed	...	.53	...	.53	...	...
West of Rocky M., frt allowed, drs ....gal. *p*	.60	.63	.60	.63	...	...
tks, frt allowed ..gal. *p*	...	.56	...	.56	...	...
Hexyl Ketone, pure, drs lb.	...	.60	...	.60	.60	1.20
Anthraquinone ....lb.	.65	.67	.65	.67	.65	.67
Butyl Ketone, tks ......lb.	...	.10½	...	.10½	.10½	.10½
Chloride, 90 lb cyl .....lb.	...	.45	...	.45	.45	.45
Ethyl Ketone, tks ......lb.	...	.07½	...	.07½	.07½	.07½
Propyl carbinol, drs ...lb.	.60	.75	.60	.75	.60	.75
Mica, dry grd, bgs, wks ..lb.	35.00	...	35.00	...	...	...
Michler's Ketone, kgs ....lb.	...	2.50	...	2.50	...	2.50
Molasses, blackstrap, tks, f.o.b. NY ....gal.	.08	.08¼	.07¾	.08¼	.06	.09
Monoamylamine, drs, wks lb.	...	1.00	...	1.00	...	1.00
Monochlorobenzene, see Chlorobenzene, mono.						
Monoethanolamine, tks, wks lb.	...	.30	...	...	...	...
Monomethylparaminosulfate, 100 lb drs ....lb.	3.75	4.00	3.75	4.00	3.75	4.00
Myrobalans 25%, liq bbls..lb.	...	.04¼	...	.04¼	.03¾	.04¼
50% Solid, 50 lb boxes lb.	.06	.06¼	.06	.06¼	.06	.06¼
J1 bgs ....ton	...	24.50	23.50	27.00	24.50	32.00
J2 bgs ....ton	...	15.00	15.00	15.75	15.75	18.00
R2 bgs ....ton	...	14.50	16.00	16.50	16.25	18.00
Naphtha. v.m. & p. (deodorized) see petroleum solvents.						
Naphtha, Solvent, water-white, tks ....gal.	...	.30	.26	.30	.26	.30
drs, c-l ....gal.	...	.35	.31	.35	.31	.35
Naphthalene, dom, crude, bgs, wks ....lb.	1.65	2.40	1.65	2.40	...	...
Imported, cif, bgs ....lb.	...	1.90	...	1.90	1.75	1.90
Dyestuffs, bgs, bbls, Eastern wks ....lb.	.04¼	.04¾	.04¼	.04¾	...	...
Balls, ref'd, bbls, Eastern wks ....lb.	.04½	.05¼	.04½	.05¼	...	...
Flakes, ref'd, bbls, Eastern wks ....lb.	.04½	.05¼	.04½	.05¼	...	...
Dyestuffs, bgs, bbls, Mid-West wks ....lb. *q*	.04¾	.05¼	.04¾	.05¼	...	...
Balls, ref'd, bbls, Mid-West wks ....lb. *q*	.05	.05¾	.05	.05¾	...	...
Flakes, ref'd, bbls, Mid-West wks ....lb. *q*	.05	.05¾	.05	.05¾	...	...
Nickel Chloride, bbls .....lb.	.18	.19	.18	.19	.18	.19
Oxide, 100 lb kgs, NY..lb.	.35	.37	.35	.37	.35	.37
Salt, 400 lb bbls, NY ...lb.	.12½	.13	.12½	.13	.11½	.13
Single, 400 lb bbls, NY lb.	.11½	.12	.11½	.12	.11½	.12
Metal ingot ....lb.	...	.35	...	.35	.35	.35
Nicotine, free 50%, 8 lb tins, cases	8.25	10.15	8.25	10.15	8.25	10.15
Sulfate, 55 lb drs ......lb.	.77	.80	.67	.80	.67	.75
Nitre Cake, blk ....ton	12.00	14.00	12.00	14.00	12.00	14.00
Nitrobenzene, redistilled, 1000 lb drs, wks ....lb.	.09	.11	.09	.11	.09	.11
tks ....lb.	...	.08½	...	.08½	...	.08½
Nitrocellulose, c-l-l cl, wks lb.	.27	.34	.27	.34	.27	.34
Nitrogenous Mat'l, bgs, imp unit	...	2.40	2.40	2.75	...	...
dom, Eastern wks ....unit	...	2.40	...	2.40	2.35	3.25
dom, Western wks ....unit	...	2.00	2.00	2.30	...	...
Nitronaphthalene, 550 lb bbls lb.	.24	.25	.24	.25	.24	.25
Nutgalls Aleppy, bgs .....lb.	.19	.20	.19	.20	.18	.20
Chinese, bgs ....lb.	.19	.20	.19	.20	.17	.20
Oak Bark Extract, 25%, bbls lb.	...	.03½	...	.03½	.03⅜	.03½
tks ....lb.	...	.02¾	...	.02¾	...	...
Octyl Acetate, tks, wks ...lb.	...	.15	...	...	...	...
Orange-Mineral, 1100 lb cks NY ....lb.	.09¼	.09¾	.09¼	.10	.09¼	.10½
Orthoaminophenol, 50 lb kgs. lb.	2.15	2.25	2.15	2.25	2.15	2.25
Orthoanisidine, 100 lb drs lb.	.82	.84	.82	.84	.82	1.15
Orthochlorophenol, drs ....lb.	.50	.65	.50	.65	.50	.65
Orthocresol, drs ....lb.	.13	.15	.13	.15	.13	.15
Orthodichlorobenzene, 1000 lb drs ....lb.	.05½	.06	.05½	.06	.05½	.06

o Country is divided in 5 zones, prices varying by zone. In drum prices range covers both zone and c-l and lcl quantities in the 5 zones; in each case, bbl. prices are 2½c higher; synthetic is not shipped in bbls.; *p* Country is divided into 5 zones. Also see footnote directly above; *q* Naphthalene quoted on Pacific Coast F.A.S. Phila. or N. Y.

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Orthonitrochlorobenzene, 1200 lb drs, wks ....lb.	.28	.29	.28	.29	.28	.29
Orthonitrotoluene, 1000 lb drs, wks ....lb.	.07	.10	.05½	.10	.05½	.06
Orthonitrophenol, 350 lb drs ....lb.	.52	.80	.52	.80	.52	.80
Orthotoluidine, 350 lb bbls, l-c-l ....lb.	.14½	.15	.14½	.15	.14	.15
Orthonitroparachlorphenol, tins ....lb.	.70	.75	.70	.75	.70	.75
Osage Orange, cryst .....lb.	.17	.25	.17	.25	.16	.25
51 deg liquid ....lb.	.07	.07¾	.07	.07¾	.07	.07¾
Powd, 100 lb bgs ......lb.	.14½	.15	.14½	.15	.14½	.15
Paraffin, refd, 200 lb cs slabs						
122-127 deg M P ....lb.	.04	.04¾	.04	.04¾	.04½	.04¾
128-132 deg M P ....lb.	.05	.0515	.05	.0515	.04¾	.0515
133-137 deg M P ....lb.	.0575	.06	.0575	.06	.05	.06
Para aldehyde, 110-55 gal drs ....lb.	.16	.18	.16	.18	.16	.18
Aminoacetanilid, 100 lb kgs ....lb.	...	.85	...	.85	.52	.85
Aminohydrochloride, 100 lb kgs ....lb.	1.25	1.30	1.25	1.30	1.25	1.30
Aminophenol, 100 lb kgs lb.	...	1.05	...	1.05	.78	1.05
Chlorophenol, drs ......lb.	.50	.65	.50	.65	.50	.65
Coumarone, 330 lb drs ..lb.	...	...	...	...	...	...
Cymene, refd, 110 gal dr ....gal.	2.25	2.50	2.25	2.50	2.25	2.50
Dichlorobenzene 150 lb bbls wks ....lb.	.16	.20	.16	.20	.16	.20
Nitroacetanilid, 300 lb bbls ....lb.	.45	.52	.45	.52	.45	.52
Nitroaniline, 300 lb bbls, wks ....lb.	.48	.55	.48	.55	.48	.55
Nitrochlorobenzene, 1200 lb drs, wks ....lb.	.23½	.24	.23½	.24	.23½	.24
Nitro-orthotoluidine, 300 lb bbls ....lb.	2.75	2.85	2.75	2.85	2.75	2.85
Nitrophenol, 185 lb bbls lb.	.45	.50	.45	.50	.45	.50
Nitrosodimethylaniline, 120 lb bbls ....lb.	.92	.94	.92	.94	.92	.94
Nitrotoluene, 350 lb bbls lb.	.35	.37	.35	.37	.35	.37
Phenylenedamine, 350 lb bbls ....lb.	1.25	1.30	1.25	1.30	1.25	1.30
Para Tertiary amyl phenol, wks, drs ....lb.	.32	.50	.32	.50	.32	.50
Toluenesulfonamide, 175 lb bbls ....lb.	.70	.75	.70	.75	.70	.75
tks, wks ....lbs.	...	.31	...	.31	...	...
Toluenesulfonchloride, 410 lb bbls, wks ....lb.	.20	.22	.20	.22	.20	.22
Toluidine, 350 lb bbls, wks ....lb.	.56	.60	.56	.60	.56	.60
Paris Green, Arsenic Basis						
100 lb kgs ....lb.	...	.24	...	.24	.23	.24
250 lb kgs ....lb.	...	.22	...	.22	...	.22
Perchlorethylene, 50 gal drs ....lb.	...	.15	...	.15	...	.15
Persian Berry Ext, bbls ..lb.	.55	Nom.	.55	Nom.	.55	Nom.
Pentane, normal, 28-38°C,						
group 3 tks ....gal.	...	.09	...	.09	.09	.09
drs, group 3 ....gal.	.10	.15	.10	.15	...	...
Petrolatum, dark amber, bbls ....lb.	.02	.02⅝	.02	.02⅞	...	...
Light, bbls ....lb.	.02½	.02⅛	.02½	.03⅛	...	...
Medium, bbls ....lb.	.02¼	.02¾	.02¼	.03	...	...
Dark green, bbls ....lb.	.02½	.02¾	.02½	.02¾	...	...
White, lily, bbls ....lb.	.05¼	.06¼	.05¼	.06½	...	...
White, snow, bbls ......lb.	.06¼	.07¼	.06¼	.07½	...	...
Red, bbls ....lb.	.02¼	.02½	.02¼	.02¾	...	...
Petroleum Ether, 30-60°,						
group 3, tks ....gal.	...	.13	...	.13	.11	.13
drs, group 3 ....gal.	.15	.16	.15	.16	.15	.17

PETROLEUM SOLVENTS AND DILUENTS

Cleaners naphthas, group 3, tks, wks ....gal.	...	.06⅞	...	.06⅞	...	...
Bayonne, tks, wks ..gal.	...	.09	...	.09	...	...
West Coast, tks ....gal.	...	.15	...	.15	...	...
Hydrogenated naphthas, frt allowed East, tks ...gal.	...	.17½	...	.17½	...	...
No. 2, tks ....gal.	...	.22½	...	.22½	...	...
No. 3, tks ....gal.	...	.17½	...	.17½	...	...
No. 4, tks ....gal.	...	.22½	...	.22½	...	...
Lacquer diluents, tks, Bayonne ....gal.	.12	.12½	.12	.12½	.12	.12½
Group 3, tks ....gal.	...	.07⅞	...	.07⅞	.06⅞	.08⅛
Naphtha, V.M.P., East, tks, wks ....gal.	...	.09	...	.09	.09	.09½
Group 3, tks, wks ...gal.	...	.06⅞	...	.06⅞	.06¼	.07¼
Petroleum thinner, East, tks, wks ....gal.	...	.09	...	.09	.09	.09
Group 3, tks, wks ...gal.	...	.05⅞	...	.05⅞	.05⅞	.06⅜
Rubber Solvents, stand grd, East, tks, wks ......gal.	...	.09	...	.09	.09	.09½
Group 3, tks, wks ..gal.	...	.06⅞	...	.06⅞	.06⅜	.06⅞
Stoddard Solvent, East, tks, wks ....gal.	...	.09	...	.09	.09	.09½
Group 3, tks, wks ...gal.	...	.06⅜	...	.06⅜	.05¾	.07⅛
Phenol, 250-100 lb drs ....lb.	.14¼	.15	.14¼	.15	.14¼	.15
Phenyl-Alpha-Naphthylamine, 100 lb kgs ....lb.	...	1.35	...	1.35	...	1.35
Phenyl Chloride, drs .....lb.	...	.16	...	.16	...	.16
Phenylhydrazine Hydrochloride ....lb.	2.90	3.00	2.90	3.00	2.90	3.00
Phloroglucinol, tech, tins ..lb.	15.00	16.50	15.00	16.50	15.00	16.50
CP, tins ....lb.	20.00	22.00	20.00	22.00	20.00	22.00

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Phosphate Rock, f.o.b. mines						
Florida Pebble, 68% basis ....ton	...	3.40	3.25	3.40	2.85	3.25
70% basis ....ton	...	3.90	...	3.90	3.35	3.90
72% basis ....ton	...	4.40	...	4.40	3.85	4.40
75-74% basis ....ton	...	5.40	...	5.40	4.90	5.40
75% basis ....ton	...	5.50	...	5.50	5.05	5.50
77-80% basis ....ton	...	6.50	...	6.50	5.90	6.50
Tennessee, 72% basis ..ton	...	4.75	...	4.75	4.75	5.00
Phosphorous Oxychloride 175 lb cyl ....lb.	.16	.20	.16	.20	.16	.20
Red, 110 lb cases ....lb.	.44	.45	.44	.45	.44	.45
Yellow, 110 lb cs, wks..lb.	.28	.33	.28	.33	.28	.33
Sesquisulfide, 100 lb cs..lb.	.38	.44	.38	.44	.38	.44
Trichloride, cyl ....lb.	.16	.20	.16	.20	.16	.20
Phthalic Anhydride, 100 lb drs, wks ....lb.	.14½	.15½	.14½	.15½	.14½	.15½
Pine Oil, 55 gal drs or bbls						
Destructive dist ....lb.	.44	.46	.44	.50	.48	.62
Steam dist wat wh bbls gal.	.64	.65	.64	.65	.64	.65
tks ....gal.	...	.59	...	.59	...	...
Straw color, bbls ....gal.	...	.59	...	.59	...	...
tks ....gal.	...	.54	...	.54	...	...
Pitch Hardwood, wks ....ton	...	15.00	15.00	20.00	...	20.00
Burgundy, dom, bbls, wks ....lb.	...	.03½	...	.03½	...	...
Imported ....lb.	.11	.13	.11	.13	...	...
Coaltar, bbls, wks ....ton	...	19.00	...	19.00	...	...
Petroleum, see Asphaltum in Gums' Section.						
Pine, bbls ....bbl.	3.75	4.25	3.75	4.25	...	...
Stearin, drs ....lb.	.03	.04½	.03	.04½	...	...
Platinum, refd ....oz.	35.00	36.00	35.00	36.00	35.00	38.00

POTASH

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Potash, Caustic, wks, sol..lb.	.06¼	.06½	.06¼	.06½	.06¼	.07⅜
flake ....lb.	.07	.07⅜	.07	.07⅜	.07	.08¼
Liquid tks ....lb.	...	.02⅞	...	.02⅞	.02⅞	.03⅝
Potash Salts, Rough Kainit 14% basis ....ton	...	8.50	...	8.50	8.50	9.70
Manure Salts, imported						
20% basis, blk ....ton	...	8.60	...	8.60	8.60	12.00
30% basis, blk ....ton	...	12.90	...	12.90	12.90	19.15
Domestic, cif ports, blk unit	...	.43	...	.43	...	...
Potassium Acetate ....lb.	.26	.28	.26	.28	.26	.28
Potassium Muriate, 80% basis bgs ....ton	...	22.00	...	22.00	22.00	37.15
Dom, blk ....unit	...	.40	...	.40	...	...
Pot & Mag Sulfate, 48% basis bgs ....ton	...	22.50	...	22.50	22.50	25.00
Potassium Sulfate, 90% basis bgs ....ton	...	35.00	...	35.00	35.00	42.15
Potassium Bicarbonate, USP 320 lb bbls ....lb.	.07½	.09	.07½	.09	.07½	.09
Bichromate Crystals, 725 lb cks ....lb.	.08⅛	.08⅝	.08⅛	.08⅝	.08⅛	.08⅝
Binoxalate, 300 lb bbls..lb.	.22	.23	.22	.23	.14	.23
Bisulfate, 100 lb kgs ..lb.	.35	.36	.35	.36	.33	.36
Carbonate, 80-85% calc 800 lb cks ....lb.	.07½	.07⅞	.07½	.07⅞	.07	.07⅞
liquid, tks ....lb.	...	...	...	...	...	...
drs, wks ....lb.	...	...	...	...	...	...
Chlorate crys, powd, 112 lb kgs, wks ....lb.	...	.09¾	...	.09¾	.08½	.09¾
gran, kgs ....lb.	.12	.13	.12	.13	...	...
powd, kgs ....lb.	.08¾	.09¾	.08¾	.09¾	...	...
Chloride, crys, bbls ....lb.	.04	.04¾	.04	.04¾	.04	.04¾
Chromate, kgs ....lb.	.23	.28	.23	.28	.23	.28
Cyanide, 110 lb cases ..lb.	.55	.57½	.55	.57½	.55	.60
Iodide, 75 lb bbls ....lb.	...	1.40	...	1.40	1.40	2.70
Metabisulfite, 300 lb bbls lb.	...	.15	...	.15	.10½	.15
Oxalate, bbls ....lb.	.16	.24	.16	.24	.16	.24
Perchlorate, cks, wks ...lb.	.09	.11	.09	.11	.09	.11
Permanganate, USP, crys, 500 & 1000 lb drs, wks lb.	.18½	.19½	.18½	.19½	.18½	.19½
Prussiate, red, 112 lb kgs lb.	.35	.38½	.35	.38½	.35	.39
Yellow, 500 lb casks ..lb.	.18	.19	.18	.19	.18	.19
Tartrate Neut, 100 lb kgs lb.	...	.21	...	.21	...	.21
Titanium Oxalate, 200 lb bbls ....lb.	.32	.35	.32	.35	.32	.35
Propane, group 3, tks	...	.07	...	.07	...	.07
Pumice Stone, lump bgs ..lb.	.04½	.06	.04½	.06	.04½	.06
250 lb bbls ....lb.	.05	.07	.05	.07	.05	.07
Powd, 350 lb bgs ....lb.	.02½	.03	.02½	.03	.02½	.03
Putty, coml, tubs ....100 lb.	...	2.75	...	2.75	2.25	2.75
Linseed Oil, kgs ...100 lb.	...	4.50	...	4.50	4.00	4.50
Pyridine, 50 gal drs ....gal.	...	1.25	...	1.25	...	1.25
Pyrites, Spanish cif Atlantic ports, blk ....unit	.12	.13	.12	.13	.12	.13
Pyrocatechin, CP, drs, tins ....lb.	2.75	3.00	2.75	3.00	2.75	3.00
Quebracho, 35% liq tks ...lb.	...	.02⅝	...	.02⅝	.02¼	.02⅝
450 lb bbls, c-l ....lb.	...	.03⅛	...	.03⅛	.02¾	.03⅛
Solid, 63%, 100 lb bales cif ....lb.	...	.03⅝	...	.03⅝	.02⅞	.03⅝
Clarified, 64%, bales..lb.	...	.03⅞	...	.03⅞	.03	.03⅞
Quercitron, 51 deg liq, 450 lb bbls ....lb.	.06	.06½	.06	.06½	.05½	.06½
Solid, 100 lb boxes ....lb.	.10	.12	.10	.12	.09½	.13
R Salt, 250 lb bbls, wks ..lb.	.44	.45	.44	.45	.40	.45
Resorcinol tech, cans ....lb.	.75	.80	.75	.80	.65	.80
Rochelle Salt, cryst ....lb.	.14	.14½	.14	.15	.12½	.16
Powd, bbls ....lb.	.13	.13½	.13	.13½	...	...
Rosin Oil, bbls, first run gal.	...	.38	.36	.45	.45	.48
Second run ....gal.	...	.45	.43	.48	.48	.53
Third run, drs ....gal.	...	.53	.50	.60	...	...

Prices

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Rosins 600 lb bbls, 280 lb unit ex. yard NY:						
B	...	4.65	4.65	5.25	4.50	5.75
D	...	5.02½	5.02½	5.25	4.60	5.85
E	...	5.22½	5.22½	5.45	4.80	6.50
F	...	5.62½	5.35	5.90	5.00	6.75
G	...	5.70	5.45	5.95	5.05	6.75
H	...	5.72½	5.50	5.97½	5.10	6.75
I	...	5.72½	5.55	6.00	6.75	4.05
K	...	5.75	5.60	6.00	5.30	6.75
M	...	5.77½	5.65	6.02½	5.45	6.80
N	...	6.12½	5.75	6.40	5.50	6.80
WG	...	6.45	6.05	6.87½	5.70	6.80
WW	...	7.35	6.40	7.55	5.90	6.85
Rosins, Gum, Savannah (280 lb unit):						
B	...	3.40	3.40	4.00	...	...
D	3.75	3.80	3.75	4.20	...	...
E	3.90	4.05	3.90	4.20	...	...
F	4.35	4.37½	4.15	4.65	...	...
G	..	4.45	4.25	4.70	...	...
H	4.45	4.47½	4.30	4.75	...	...
I	4.45	4.47½	4.35	4.75	...	...
K	..	4.45	4.35	4.75	...	...
M	4.50	4.55	4.35	4.75	...	...
N	4.85	4.90	4.50	5.15	...	...
WG	5.15	5.25	4.80	5.60	...	...
WW	...	6.10	5.25	6.25	...	...
X	...	6.15	5.25	6.25	...	...
Rosins, Wood, wks (280 lb unit), FF	5.20	6.10	4.30	6.35	...	...
I	5.85	6.75	4.65	7.00	...	...
M	6.35	7.25	5.00	7.25	...	...
N	6.85	7.75	5.40	7.75	...	...
Rosin, Wood. c-l, FF grade, NY	...	5.15	5.10	5.30	5.10	6.13
Rotten Stone, bgs mines ..ton	23.50	24.00	23.50	24.00	23.50	24.00
Lump, imported, bbls ..lb.	.05	.07	.05	.07	.05	.07
Selected, bbls ....lb.	.08	.10	.08	.10	.08	.12
Powdered, bbls ....lb.	.02½	.05	.02½	.05	.02½	.05
Sago Flour, 150 lb bgs ....lb.	.02¾	.03¾	.02¾	.03¾	.02½	.03¾
Sal Soda, bbls, wks ..100 lb.	...	1.30	...	1.30	1.10	1.30
Salt Cake, 94-96%, c-l, wks ....ton	13.00	18.00	13.00	18.00	13.00	18.00
Chrome, c-l, wks ......ton	12.00	13.00	12.00	13.00	12.00	13.00
Saltpetre, double refd, gran, 450-500 lb bbls ......lb.	.059	.06¼	.059	.06¼	.059	.06¼
Powd, bbls ....lb.	.069	.07⅞	.069	.07⅞	...	...
Cryst, bbls ....lb.	.069	.08	.069	.08	...	..
Satin, White, 550 lb bbls ..lb.	...	.01½		.01½	...	.01½
Shellac, Bone dry, bbls ..lb. r	.20	.22	.19	.32	.26	.37
Garnet, bgs ....lb.	.17	.19	.17	.27	.26	.32
Superfine, bgs ....lb. s	.16½	.17	.16	.28	.23	.31
T. N., bgs ....lb. s	.14	.15	.13	.25	...	...
Schaeffer's Salt, kgs ......lb.	.48	.50	.48	.50	.48	.50
Silver Nitrate, vials ......oz.	...	.53¾	.38	.53¾	.31⅞	.40½
Slate Flour, bgs, wks ....ton	9.00	10.00	9.00	10.00	9.00	10.00
Soda Ash, 58% dense, bgs, c-l, wks ....100 lb.	...	1.25	...	1.25	...	1.25
58% light, bgs .....100 lb.	...	1.23	...	1.23	...	1.25
blk ....100 lb.	...	1.05	...	1.05	...	1.05
paper bgs ....100 lb.	...	1.20	...	1.20	...	1.20
bbls ....100 lb.	...	1.50	...	1.50	...	1.50
Soda Caustic, 76% grnd & flake, drs ....100 lb.	...	3.00	...	3.00	...	3.00
76% solid, drs .....100 lb.	...	2.60	...	2.60	...	2.60
Liquid sellers, tks, 100 lbs.	...	2.25	...	2.25	...	2.25
Sodium Abietate, drs .....lb.	...	.08	...	.08	.03	.08
Acetate, tech, 450 lb bbls, wks ....lb.	.04½	.05	.04½	.05	.04½	.05
Alignate, drs ....lb.	...	.64	...	.64	.50	.64
Arsenate, drs ....lb.	...	.10½	...	.10½	.07¾	.10½
Arsenite, liq, drs .....gal.	.40	.75	.40	.75	.40	.75
Benzoate, USP, kgs .. lb.	.46	.48	.46	.48	.45	.48
Bicarb, 400 lb bbl, wks . 100 lb.	...	1.85	...	1.85	1.85	1.85
Bichromate, 500 lb cks, wks ....lb.	.06⅛	.06⅝	.06⅛	.06⅝	.06⅛	.06⅝
Bisulfite, 500 lb bbl, wks lb.	.03¼	.036	.03¼	.036	.03	.036
35-40% sol cbys, wks 100 lb.	1.95	2.10	1.95	2.10	...	...
Chlorate, bgs, wks .....lb.	.06¼	.07½	.06¼	.07½	.06¼	.07½
Chloride, tech ....ton	13.60	16.50	13.60	16.50	11.40	16.50
Cyanide, 96-98%, 100 & 250 lb drs, wks ......lb.	.15½	.17½	.15½	.17½	.15½	.17½
Fluoride, 90%, 300 lb bbls, wks ....lb.	.07¼	.08¼	.07¼	.08¼	.07¼	.09½
Hydrosulfite, 200 lb bbls, f.o.b. wks ....lb.	.19	.20	.19	.21	.19½	.21
Hyposulfite, tech, pea crys 375 lb bbls, wks 100 lb.	2.50	3.00	2.50	3.00	2.40	3.00
Tech, reg cryst, 375 lb bbls, wks ......100 lb.	2.40	2.75	2.40	2.75	2.40	2.75
Iodide ....lb.	...	2.40	...	2.40	2.40	3.50
Metanilate, 150 lb bbls ..lb.	.41	.42	.41	.42	.41	.42
Metasilicate, gran, c-l, wks ....100 lb.	2.65	3.05	2.65	3.05	2.65	3.05
cryst, bbls, wks ..100 lb.	...	3.25	...	3.25	...	3.25
Monohydrate, bbls .....lb.	...	.02½	...	.02½	...	.02½
Napthenate, drs ....lb.	...	.09	...	.09	.09	.13
Naphthionate, 300 lb bbl lb.	.52	.54	.52	.54	.52	.54
Nitrate, 92%, crude, 200 lb bgs, c-l, NY ....ton	...	24.80	...	24.80	24.80	26.30
100 lb bgs ....ton	...	25.50	...	25.50	25.50	27.00
Bulk ....ton	...	23.50	...	23.50	23.50	24.50

r Bone dry prices at Chicago 1c higher; Boston ½c; Pacific Coast 3c; Philadelphia deliveries f.o.b. N. Y.; refined 6c higher in each case; s T. N. and Superfine prices quoted f.o.b. N. Y. and Boston; Chicago prices 1c higher; Pacific Coast 3c; Philadelphia f.o.b. N. Y.

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Sodium (continued)						
Nitrite, 500 lb bbls ....lb.	.07¼	.08	.07¼	.08	.07¼	.08
Orthochlorotoluene, sulfonate, 175 lb bbls, wks lb.	.25	.27	.25	.27	.25	.27
Perborate, 275 lb bbls ..lb.	.17	.18	.17	.19	.18	.19
Peroxide, bbls, 400 lb ..lb.	..	.17	...	.17	...	.17
Phosphate, di-sodium, tech, 310 lb bbls, wks 100 lb.	..	2.20	...	2.20	2.10	2.40
bgs, wks ......100 lb.	...	2.00	...	2.00	...	...
tri-sodium, tech, 325 lb bbls, wks ......100 lb.	..	2.60	...	2.60	2.60	2.70
bgs, wks ......100 lb.	...	2.60	...	2.60	...	..
Picramate, 160 lb kgs ..lb.	.67	.69	.67	.69	.69	.72
Prussiate, Yellow, 350 lb bbl, wks ... .lb.	.11½	.12	.11½	.12	.11½	.12
Pyrophosphate, anhyd, 100 lb bbls .. ..lb.	.102	.132	.102	.15	...	.15
Silicate, 60°, 55 gal drs, wks ....100 lb.	1.65	1.70	1.65	1.70	1.65	1.70
40°, 35 gal drs, wks 100 lb.	...	.80	...	.80	..	.80
tks, wks ....100 lb.	...	.65	...	.65	...	.65
Silicofluoride, 450 lb bbls NY ....lb.	.04¼	.04½	.04¼	.04¾	.04¾	.06
Stannate, 100 lb drs ....lb.	.33	.34	.31	.37	.33½	.37½
Stearate, bbls ....lb.	.20	.25	.20	.25	.20	.25
Sulfanilate, 400 lb bbls..lb.	.16	.18	.16	.18	.16	.18
Sulfate Anhyd, 550 lb bbls c-l, wks ....100 lb. †	1.30	1.55	1.25	2.35	2.20	2.85
Sulfide, 80% cryst, 440 lb bbls, wks ....lb.	...	.02¼	...	.02¼	.02¼	.02½
62% solid, 650 lb drs, c-l, wks ....lb.	...	.03	...	.03	...	.03
Sulfite, cryst, 400 lb bbls, wks ....lb.	.023	.02½	.023	.02½	.02¼	.02½
Sulfocyanide, bbls .. ..lb.	.32	.42½	.32	.42½	.28	.42½
Tungstate, tech, crys, kgs ....lb.	...	.90	...	.90	.70	.90
Spruce Extract, ord, tks ..lb.	...	.01	...	.01	...	.01
Ordinary, bbls ....lb.	...	.01½	...	.01½	...	.01½
Super spruce ext, tks .. lb.	...	.01⅝	...	.01⅝	...	.01⅜
Super spruce ext, bbls ..lb.	...	.01⅞	...	.01⅞	...	.01⅞
Super spruce ext, powd, bgs ....lb.	...	.04	...	.04	...	.04
Starch, Pearl, 140 lb bgs ....100 lb.	3.58	3.78	3.36	3.78	2.81	3.76
Powd, 140 lb bgs ...100 lb.	3.68	3.88	3.46	3.66	2.71	3.66
Potato, 200 lb bgs ......lb.	.04½	.05½	.04½	.06	.05¼	.06
Imp, bgs ....lb.	.05¾	.06	.05¾	.06½	.06	.06½
Rice, 200 lb bbls ...... lb.	...	.07¼	.07¼	.08½	.07½	.08½
Wheat, thick bgs .... ..lb.	...	.08¼	...	.08¼	.06¼	.08¼
Strontium carbonate, 600 lb. bbls, wks ....lb.	.07¼	.07½	.07¼	.07½	.07¼	.07½
Nitrate, 600 lb bbls, NY ....lb.	.08¾	.09½	.08¾	.09½	.08¾	.11
Sulfur	...	...	...	...	...	...
Crude, f.o.b. mines ....ton	18.00	19.00	18.00	19.00	18.00	19.00
Flour, coml, bgs ....100 lb.	1.60	2.35	1.60	2.35	1.60	2.35
bbls ....100 lb.	1.95	2.70	1.95	2.70	1.95	2.70
Rubbermakers, bgs ..100 lb.	2.20	2.80	2.20	2.80	2.20	2.80
bbls ....100 lb.	2.55	3.15	2.55	3.15	2.55	3.15
Extra fine, bgs .....100 lb.	2.40	3.00	2.40	3.00	2.40	3.00
Superfine, bgs .....100 lb.	2.20	2.80	2.20	2.80	2.20	2.80
bbls ....100 lb.	2.25	3.10	2.25	3.10	2.25	3.10
Flowers, bgs ....100 lb.	3.00	3.75	3.00	3.75	3.00	3.75
bbls ....100 lb.	3.35	4.10	3.35	4.10	3.35	4.10
Roll, bgs ....100 lb.	2.35	3.10	2.35	3.10	2.35	3.10
bbls ....100 lb.	2.50	3.25	2.50	3.25	2.50	3.25
Sulfur Chloride, red, 700 lb drs, wks ....lb.	.05	.05½	.05	.05½	.05	.05½
Yellow, 700 lb drs, wks lb.	.03½	.04½	.03½	.04½	.03½	.04½
Sulfur Dioxide, 150 lb cyl lb.	.08½	.10	.08½	.10	.07	.10
Multiple units, wks ....lb.	...	.06½	...	.06½	...	...
tks, wks ....lb.	...	.04¾	...	.04¾	...	...
Refrigeration, cyl, wks ...lb.	...	.13	...	.13	...	...
Multiple units, wks ....lb.	...	.09¼	...	.09¼	...	...
Sulfuryl Chloride ....lb.	.15	.40	.15	.40	.15	.40
Sumac, Italian, grd ......ton	59.00	62.00	...	60.00	58.00	75.00
dom, bgs, wks ....ton	...	35.00	...	35.00	...	...
Superphosphate, 16% bulk, wks ....ton	...	8.50	...	8.50	8.00	8.50
Run of pile ....ton	...	8.00	...	8.00	7.50	8.00
Talc, Crude, 100 lb bgs, NY ....ton	14.00	15.00	14.00	15.00	12.00	15.00
Refd, 100 lb bgs, NY ton	16.00	18.00	16.00	18.00	16.00	18.00
French, 220 lb bgs, NY ton	22.00	30.00	22.00	30.00	27.50	30.00
Refd, white, bgs .....ton	45.00	60.00	45.00	60.00	45.00	60.00
Italian, 220 lb bgs to arr ton	70.00	75.00	70.00	75.00	70.00	75.00
Refd, white, bgs, NY ton	75.00	80.00	75.00	80.00	75.00	80.00
Tankage Grd, NY ....unit ‡	...	2.60	2.60	2.75	2.50	3.25
Ungrd ....unit ‡	...	2.50	2.40	2.50	2.00	2.75
Fert grade, f.o.b. Chicago ....unit ‡	...	2.40	2.40	2.60	1.80	2.40
South American cif..unit ‡	...	2.75	2.75	3.15	2.75	3.10
Tapioca Flour, high grade, bgs ....lb.	.0215	.05	.0215	.05	.0215	.05
Tar Acid Oil, 15%, drs gal.	.21	.22	.21	.22	.21	.22
25%, drs ....gal.	.23	.24	.23	.24	.23	.24
Tar, pine, delv, drs .....gal.	.25	.26	.25	.26	...	...
tks, delv ....gal.	...	.20	...	.20	...	...
Tartar Emetic, tech ......lb.	.22¾	.23	.22¾	.23	.23	.23
USP, bbls ....lb.	.28	.28½	.28	.28½	.27	.28½
Terpineol, den grd, drs ...lb.	.13¾	.14¾	.13¾	.14¾	...	...
tks ....lb.	.13	.14	.13	.14	...	...
Tetrachlorethane, 50 gal drs lb.	.08½	.09	.08½	.09	.08½	.09
Tetralene, 50 gal drs, wks lb.	.12	.13	.12	.13	.12	.13
Thiocarbanilid, 170 lb bbl lb.	.20	.25	.20	.25	.20	.25

† Bags 15c lower; ‡ + 10.

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Tin, crystals, 500 lb bbls, wks ....lb.	.38	.38½	.36	.38½	.30	.40½
Metal, NY ....lb.	...	.50½	.456	.51¼	.50⅞	.55⅜
Oxide, 300 lb bbls, wks lb.	.53	.55	.51	.58	.55	.60
Tetrachloride, 100 lb drs, wks ....lb.	...	.26	.24¾	.26	.25½	.28½
Titanium Dioxide, 300 lb bbls ....lb.	.17¼	.19¼	.17¼	.19¼	.17¼	.19¼
Barium Pigment, bbls ....lb.	.06¼	.06½	.06¼	.06½	.06¼	.06½
Calcium Pigment, bbls ....lb.	.06¼	.06½	.06¼	.06½	.06¼	.06½
Toluol, 110 gal drs, wks gal.	...	.35	...	.35	...	.35
8000 gal tks, frt allowed gal.	...	.30	...	.30	...	.30
Toluidine, mixed, 900 lb drs, wks ....lb.	.27	.28	.27	.28	.27	.28
Toner Lithol, red, bbls ....lb.	.75	.80	.75	.80	.75	.85
Para, red, bbls ....lb.	...	.75	...	.75	.75	.80
Toluidine, bgs ....lb.	...	1.35	...	1.35	...	1.35
Triacetin, 50 gal drs, wks lb.	.32	.36	.32	.36	.32	.36
Triamyl Borate, drs, wks lb.	...	.40	...	.40	...	.40
Triamylamine, drs, wks ...lb.	...	1.25	...	1.25	1.00	1.25
Trichlorethylene, 50 gal drs lb.	.09½	.10	.09½	.10	.09½	.10
Triethanolamine, 50 gal drs wks ....lb.	.26	.30	.26	.38	.35	.38
tks, wks ....lb.	...	.25	...	...	...	...
Tricresyl Phosphate, drs ..lb.	.21	.23	.21	.23	.19	.26
Triphenyl Guanidine ....lb.	.58	.60	.58	.60	.58	.60
Tripoli, airfloated, bgs, wks ....ton	27.50	30.00	27.50	30.00	...	...
Tungsten, Wolframite per unit	15.00	15.25	15.00	15.25	12.00	15.25
Turpentine (Spirits), c-l, NY dock, bbls ....gal.	...	.52¼	.49¾	.55½	.46¼	.63½
Savannah, bbls ....gal.	...	.47¼	.45	.50¼	.41¼	.58½
Jacksonville, bbls ....gal.	...	.47¼	.45	.50¼	.41¼	.58½
Wood Steam dist, bbls, c-l, NY ....gal.	...	.47	.45	.49	.41	.61
Urea, pure, 112 lb cases ..lb.	.15½	.17	.15½	.17	.15	.17
Fert grade, bgs c.i.f. ..ton	100.00	120.00	100.00	120.00	90.00	120.00
c.i.f. S.A. points ....ton	100.00	120.00	100.00	120.00	90.00	120.00
Urea Ammonia liq 55% NH_3, tks ....unit	...	.96	...	.96	...	.96
Valonia beard, 42%, tannin bgs ....ton	...	43.00	42.50	43.50	39.00	48.00
Cups, 32% tannin, bgs..ton	...	27.50	27.50	28.50	23.00	32.50
Mixture, bark, bgs ....ton	...	32.00	...	32.00	...	32.00
Vermillion, English, kgs ..lb.	1.56	1.70	1.56	1.70	1.41	1.73
Vinyl Chloride, 16 lb cyl ..lb.	...	1.00	...	1.00	...	1.00
Wattle Bark, bgs ....ton	...	30.00	29.25	32.00	29.50	34.00
Extract, 60°, tks, bbls ..lb.	...	.03¾	...	.03¾	.03⅝	.03⅞

WAXES

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Wax, Bayberry, bgs ....lb.	.22	.23	.22	.23	.25	.30
Bees, bleached, white 500 lb slabs, cases ....lb.	.33½	.34	.33½	.34	.32	.37
Yellow, African, bgs ..lb.	.21¾	.22½	.21	.22½	.16	.22
Brazilian, bgs ....lb.	.23½	.25	.22	.25	...	...
Chilean, bgs ....lb.	.23½	.25	.22	.24½	...	...
Refined, 500 lb slabs, cases ....lb.	.27½	.28	.27½	.28	.21	.29
Candelilla, bgs ....lb.	.11	.12½	.10	.12½	.10¼	.14½
Carnauba, No. 1, yellow, bgs ....lb.	.39	.40	.35	.40	.30	.40
No. 2, yellow, bgs ....lb.	.38	.39	.34	.39	.34	.41
No. 2, N. C., bgs ....lb.	.32	.33	.26½	.33	.20	.29
No. 3, Chalky, bgs ...lb.	.30	.31	.21	.31	...	...
No. 3, N. C., bgs ....lb.	...	.31	.22½	.31	.16¼	.25
Ceresin, white, imp, bgs lb.	.43	.45	.43	.45	...	...
Yellow, bgs ....lb.	.36	.38	.36	.38	...	...
Domestic, bgs ....lb.	.08	.11	.08	.11	...	...
Japan, 224 lb cases ....lb.	.07¼	.07¾	.06	.07¾	.06	.07½
Montan, crude, bgs ....lb.	.10½	.11½	.10½	.11½	.10	.11
Paraffin, see Paraffin Wax.						
Spermaceti, blocks, cases lb.	.26	.23	.19	.23	.18	.20
Cakes, cases ....lb.	.23	.25	.20	.25	.19	.21
Whiting, 200 lb bgs, c-l, wks ....ton	...	12.00	...	12.00	...	...
Alba, bgs, c-l, NY ....ton	...	15.00	...	15.00	...	15.00
Gliders, bgs, c-l, NY ...ton	...	15.00	...	15.00	...	...
Wood Flour, c-l, bgs ....ton	18.00	30.00	18.00	30.00	18.00	30.00
Xylol, frt allowed, East 10° tks, wks ....gal.	.31	.33	.27	.33	.27	.29
Coml, tks, wks, frt allowed ....gal.	...	.30	.26	.30	...	.26
Xylidine, mixed crude, drs lb.	.36	.37	.36	.37	.36	.37
Zinc, Carbonate tech, bbls, NY ....lb.	.09½	.11	.09½	.11	.09½	.11
Chloride fused, 600 lb drs, wks ....lb.	.04½	.05¾	.04½	.05¾	.04¼	.05¼
Gran, 500 lb bbls, wks ..lb.	.05	.05¾	.05	.05¾	.05⅛	.06
Soln 50%, tks, wks..100 lb.	...	2.00	...	2.00	...	2.00
Cyanide, 100 lb drs ....lb.	.36	.41	.36	.41	.36	.41
Zinc Dust, 500 lb bbls, c-l, delv ....lb.	...	.061	.057	.061	.0567½	.071
Metal, high grade slabs, c-l, NY ....100 lb.	...	4.45	4.05	4.45	4.05	4.75
E. St. Louis ....100 lb.	...	4.10	3.70	4.10	3.70	4.46
Oxide, Amer, bgs, wks..lb.	.05¾	.06¼	.05¾	.06¼	.05¾	.06¼
French, 300 lb bbls, wks ....lb.	.06½	.10⅞	.06½	.10⅞	.05¾	.11⅛
Palmitate, bbls ....lb.	.22	.23	.21	.23	.20	.22
Perborate, 100 lb drs ...lb.	...	1.25	...	1.25	...	1.25
Peroxide, 100 lb drs ...lb.	...	1.25	...	1.25	...	1.25
Resinate, fused, dark, bbls lb.	.05¾	.06½	.05¾	.06½	.05¾	.06½
Stearate, 50 lb bbls ....lb.	.19	.22	.18	.22	.18	.21

Current

Zinc Sulfate
Oil, Whale

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Zinc Sulfate, crys, 400 lb bbl, wks ....lb.	.028	.033	.028	.033	.02¾	.033
Flake, bbls ....lb.	.035	.032	.035	.032	...	...
Sulfide, 500 lb bbls, delv lb.	.10¾	.11¾	.10¾	.11¾	.10¾	.13½
bgs, delv ....lb.	.10½	.11½	.10½	.11½	...	...
Sulfocarbolate, 100 lb kgs ....lb.	.24	.25	.24	.25	.21	.25
Zirconium Oxide, Nat kgs lb.	.02½	.03	.02½	.03	.02½	.03
Pure, kgs ....lb.	.45	.50	.45	.50	.45	.50
Semi-refined, kgs ....lb.	.08	.10	.08	.10	.08	.10

Oils and Fats

	Current Market		1935 Low	1935 High	1934 Low	1934 High
Castor, No. 3, 400 lb bbls..lb.	.09¾	.10½	.09¾	.10½	.09¾	.10½
Blown, 400 lb bbls ....lb.	.11½	.12¼	.11½	.16	.11½	12¾
China Wood, bbls spot NY lb.	.14½	Nom.	.094	.16	.07½	.099
Tks, spot NY ....lb.	.12⅞	.13¼	.088	.14	.07¼	.094
Coast, tks ....lb.	.12¾	.13	.087	.13	.06⅞	.094
Coconut, edible, bbls NY..lb.	...	.11¼	.04	.12	.04¾	.10¾
Manila, bbls NY ....lb.	...	.06	.04¾	.06	.03¾	.04¼
Tks, NY ....lb.	...	.05¾	.03¾	.06¼	.02⅝	.03¾
Tks, Pacific Coast ...lb.	...	.05¼	.03½	.06	.02¼	.02½
Cod, Newfoundland, 50 gal bbls ....gal.	.35	.36	.36	.38	.34	.40
Copra, bgs, NY ....lb.	.0325	.0335	.02	.038	.0012	.021
Corn, crude, bbls, NY ....lb.	...	.12½	.10½	.12½	.04⅝	.10½
Tks, mills ....lb.	.09¼	.09½	.09¼	.11	.03½	.09½
Refd, 375 lb bbls, NY ..lb.	.12½	.13	.12	.14	.05¾	.12
Cottonseed, see Oils and Fats News Section.						
Degras, American, 50 gal bbls, NY ....lb.	.05¼	.06¾	.04½	.06	.02¾	.05½
English, brown, bbls, NY lb.	.04¾	.05½	.04¾	.06½	.03¾	.05⅜
Greases, Yellow ....lb.	.06¼	.06⅜	.05	.06⅝	.02⅜	.05⅛
White, choice bbls, NY lb.	.07	.08¼	.05¼	.08¼	.02¾	.05⅝
Herring, Coast, tks ....gal.	...	Nom.	.23	Nom.	.15	.23
Lard Oil, edible, prime ...lb.	...	.16¾	.09¾	.17	...	.09¾
Extra, bbls ....lb.	...	.11½	.08½	.11½	.07	.08½
Extra, No. 1, bbls ....lb.	...	.10¼	.08¼	.11	.06⅜	.08¼
Linseed, Raw, less than 5 bbl lots ....lb.	...	.103	.095	.103	.101	.105
bbls, c-l spot ....lb.	...	.095	.087	.095	.087	.101
Tks ....lb.	...	.089	.081	.089	.081	.095
Menhaden, tks, Baltimore gal.	.30	Nom.	.25	.35	.15	.25
Refined, alkali, drs ....lb.	...	.075	.061	.075	.052	.069
Tks ....lb.	...	.069	.055	.069	.046	.061
Light pressed, drs ....lb.	...	.069	.055	.069	.046	.057
Tks ....lb.	...	.063	.049	.063	.04	.05
Neatsfoot, CT, 20° bbls, NY ....lb.	...	.16½	...	.16½	...	.16½
Extra, bbls, NY ....lb.	...	.11	.08½	.11¼	.07	.08½
Pure, bbls, NY ....lb.	...	.11¾	.11¾	.12	.12	.13
Oleo, No. 1, bbls, NY ....lb.	...	.13	.10¾	.14½	.06	.11½
No. 2, bbls, NY ....lb.	...	.12¼	.10	.13¾	.05⅜	.11¼
Olive, denat, bbls, NY ...gal.	.85	.86	.84	.95	.76	.90
Edible, bbls, NY ....gal.	1.65	1.80	1.55	1.80	1.55	1.90
Foots, bbls, NY ....lb.	.08⅜	.08½	.07⅛	.08¾	.06½	.07½
Palm, Kernel, casks ....lb.	.047	Nom.	.03	.05⅜	.02½	.04¼
Niger, cks ....lb.	.04½	.04¾	.034	.05¾	.031	.03¾
Peanut, crude, bbls, NY ..lb.	...	.10½	.10½	.10¾	.06½	.10¾
Refined, bbls, NY ....lb.	...	.13	.12½	.14	.07½	.12½
Perilla, drs, NY ....lb.	.07¾	.08	.07¾	.08¾	.08¼	.09⅝
Tks, Coast ....lb.	.07¼	.07⅜	.07¼	.08¼	.07½	.09
Pine, see Pine Oil, Chemical Section.						
Rapeseed, blown, bbls, NY lb.	.085	.087	.08	.09	.08	.082
Denatured, drs. NY ...gal.	.43	.45	.40	.53	.37	.44
Red, Distilled, bbls ....lb.	.09⅛	.10⅛	.07⅜	.10⅛	.06⅞	.08⅜
Tks ....lb.	...	.08¼	.06½	.08¼	.06	.06½
Salmon, Coast, 8000 gal tks ....gal.	.32½	Nom.	.25	.32½	.15	.21
Sardine, Pac Coast, tks ..gal.	.35	.37	.24½	.37	.13	.25
Refined alkali, drs ....lb.	.075	.079	.065	.079	...	...
Tks ....lb.	...	.069	.06	.069	...	...
Light pressed, drs ....lb.	.069	.073	.055	.073	...	...
Tks ....lb.	...	.063	.049	.063	...	...
Sesame, yellow, dom ....lb.	.13	.13½	.12¼	.13¾	.07½	.13¼
White, dos ....lb,	.13	.13½	.12¾	.13¾	.08	.13¼
Soy Bean, crude						
Dom, tks, f.o.b. mills ..lb.	.096	.10	.08	.10	.06	.08
Crude, drs, NY ....lb.	.101	.10½	.086	.11	.066	.09
Refd, bbls, NY ....lb.	.106	.115	.091	.115	.071	.102
Tks ....lb.	.10	.10½	.08	.10½	...	...
Sperm, 38° CT, bleached, bbls NY ....lb.	.099	.101	.099	.101	.106	.11
45° CT, bleached, bbls, NY ....lb.	.092	.094	.092	.094	.099	.103
Stearic Acid, double pressed dist bgs ....lb.	.11¼	.12¼	.10	.12¼	.09	.11
Double pressed saponified bags ....lb.	.11¾	.12¾	.09	.12¾	.09	.10
Triple pressed dist bgs ..lb.	.14	.15	.12¾	.15¼	.11¾	.13¾
Stearine, Oleo, bbls ....lb.	.10½	.10⅝	.09¼	.12½	.05	.10⅝
Tallow City, extra loose ..lb.	.06⅝	.07	.05⅜	.07	.02⅞	.05⅜
Edible, tierces ....lb.	...	.08¼	.07¼	.08¼	.04¾	.07¼
Acidless, tks, NY ....lb.	...	.10	.07½	.10¾	.06	.07½
Turkey Red, single, bbls ..lb.	.07½	.08	.07½	.08	.07½	...
Double, bbls ....lb.	.12½	.13	.12½	.13	.12½	.13
Whale, crude, coast, tks ..lb.	...	.04	...	.04	...	...
Winter bleach, bbls, NY lb.	.081	.083	.07	.083	...	.072
Refined, nat, bbls, NY ..lb.	.077	.083	.064	.081	.064	.07

THE CHEMICAL MARKET-PLACE

Local Suppliers

A selected Directory of responsible manufacture-sales agents, and jobbers who maintain spot stocks of chemicals, dye and tanstuffs, gums, naval stores, paint and fertilizer materials and similar products. Let us tell you about our combination contract for space on this page and in our Chemical Guide-Book.

MASSACHUSETTS

RHODE ISLAND

Index to Advertisers

"We"—Editorially Speaking

Our own "I told you so department": An editorial published in CHEMICAL INDUSTRIES just twelve months ago: "The ultimate consequences of the codes will be either to limit output or to protect the inefficient producer. Production quotas will stabilize profits, but only at the expense of the proper balance with normal demand. No-sales-below-costs, established on present inflated investments and present reduced operations, is a big blanket to cover waste and incompetency.

"Such consequences do not make for permanent, widespread national prosperity. This is our real, our only objective. This law and its administration should be judged by these standards."

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Did you know—

That the late publisher of the *New York Times*, Adolph S. Ochs, was fired from his first job as a drug store clerk for selling a customer borax for sal soda?

That the old Hazard homestead near Syracuse, which was built during the Gay Nineties by Frederick R. Hazard when president of the Solvay Company, is being razed to make room for a laboratory?

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We congratulate Dr. Little and the centennial number of his *Industrial Bulletin*. Particularly we enjoyed his editorial, which said, in part:

"When shortly after the French Revolution, a Parisian was asked, 'What did you do during the Reign of Terror?' he replied, 'I survived.' We, likewise, are content that our *Bulletin* has similarly survived the 'Coolidge prosperity,' the 'Hoover Depression,' and the 'Roosevelt Recovery.' Survival, in these times, is synonymous with success."

But the *Bulletin* has done more than survived. It is admirably fulfilling its purpose of providing bankers, investors, and industrial executives with early and authoritative information bearing upon the present status of industrial development and indicating probable trends.

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"'Have codes aided recovery?' The answer is no! Reasons lie in the misguided objectives of NRA, in the failure of the public-works campaign to raise purchasing power, in the absence of policies to guide the colossal code-making task, and in the crusading spirit of 'the mad, hectic days' of goldfish-bowl fame." The past are the words of A. J. Hettinger, whose article in this issue, is abstracted from *Engineering News-Record*, February 7, 1935.

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Herbert H. Dow will be the next Chemical Pioneer whose life story will be told in the June issue.

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To one of his fellow Grassellites, Howard Mansfield pointed out the item on this page in the March issue that recorded under the heading "Fifteen Years Ago" that Jack Kienle had been elected vice president of Mathieson.

"Why that's not any news" was the critical comment. "I've known that at least two years."

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A rising young chemical sales manager has confessed to us his rule for success: Know every major executive in the industry—and every pretty stenographer.

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Which in some way reminds us of a popular production man in Charleston who is such a good mixer that it is said of him that, like a certain well advertised sparkling water, he blends perfectly with Scotch, Irish or Bourbon.

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Code Authority for the Pretzel Industry is proposing amendments which would permit formulation of standards of "ingredients, products, nomenclature, terminology." Let's hope the holes are not all made uniform by an NRA ukasé.

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The article in this issue by Harry L. Derby is the substance of his address before the April meeting of the Philadelphia Chemical Club; a gathering, by the way, which broke all attendance records for this ancient but aggressive organization.

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That irrepressible statistician, Carl de Long, has estimated that of the total attendance at the ACS meeting, in New York, last month, 102 per cent. went to the free theatre party and .01½ per cent. played in the golf tournament, which demonstrates in inverse ratio, one of the differences between chemists and salesmen.

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Now off the press and ready for mailing, the new 1935 (11th annual) edition of the CHEMICAL GUIDE-BOOK, with 108 more pages than last year; 152 new chemicals listed; over 700 changes in firms and addresses, but the price is the same, $2.00 a copy, or $1 to our subscribers.

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R. M. Carter's article, in this issue, was part of a symposium of paint and paint materials presented to the 1935 regional meeting of the American Society for Testing Materials, in Philadelphia, Pa.

Fifteen Years Ago

From our issues of May, 1920

Dr. William H. Nichols, Chairman Board, General Chemical, makes gift of $100,000 to the endowment fund campaign of New York University, of which he was a graduate.

Barrett Company file plans for construction of an eight and seventeen-story building at 40 Rector Street, at an estimated cost of $2,000,000.

Elon H. Hooker formally announces his candidacy for the Republican nomination for Governor of New York State.

Dow Chemical will soon move to larger office quarters in 90 West Street, New York.

U. S. Consul at Japan reports guarantee of a minimum allotment of camphor to the U. S. for the months of May and June of 327,386 pounds.

Henry Howard, formerly president, Merrimac Chemical, is now connected with the Grasselli Chemical Co.

Ellwood Hendrick elected president of the Chemists' Club.

John W. Hyatt, inventor of Celluloid, dies at Short Hills, N. J.

Plant of Casein Manufacturing Co., at Bainbridge, N. Y., containing 1,500,000 pounds of casein, destroyed by fire.

Charles Pfizer & Co. file certificate with State of New Jersey, increasing the capital stock to $2,500,000.

Wishnick-Tumpeer Chemical Company incorporated at Chicago, with capital of $100,000, to manufacture chemicals and dyes.

CHEMICAL INDUSTRY'S CONTRIBUTION TO THE NATION

JOHN WINTHROP, Jr.

Being a Record of American Chemical Accomplishments since 1635 when John Winthrop, Jr. founded the Industry in this Country. Published as a Supplement to Chemical Industries, May, 1935

Chemical Industry's Contribution to the Nation: 1635-1935

A Record of Chemical Accomplishment, with an Index of the Chemicals Made in America: Williams Haynes & Edward L. Gordy, Editors

A Supplement to Chemical Industries, May, 1935. Published in Celebration of the Tercentenary of the Founding of the American Chemical Industry by John Winthrop, Jr., and for Sale Separately at One Dollar the Copy; in Cloth Binding, Two Dollars: 25 Spruce Street, New York, N. Y.

Printed in the United States of America

Foreword

THREE hundred years of chemical manufacturing in America—the first thought, even of those of us closest to the chemical industry, is one of surprise that it traces back to so distinguished a colonial ancestry. Yet there is no doubt that the production of alum and saltpeter are true chemical operations, and there is a strangely familiar ring to the fact that the first chemical enterprise was established the very year the bloody Pequot War broke out, to make saltpeter for the manufacture of gunpowder.

From its very beginning the American chemical industry has been a vital part of the national defense. Our first chemical plant came into operation as a producer of munitions at the very outbreak of the first important Indian war in New England.

Moreover, its second product, alum, was produced to assist in what was at the time one of the most important export industries of the Massachusetts Bay Colony. So the important contribution of chemicals to all our industrial growth also began at the very beginning of chemical making in America.

Throughout the colonial period of our history chemical development was slow and uncertain. It was hampered by parliamentary restrictions and limited markets. But after the Revolution, when John Harrison began making sulfuric acid in Philadelphia, a gradual but very steady growth began.

War has always in all countries been a powerful stimulant to chemical activity, and the hard-fought years of 1861-65 saw great chemical expansion followed by a faster rate of chemical growth. Between Appomattox and the Marne our dependence upon imported chemicals lessened continually. Not only were we manufacturing a reasonably complete line of the standard heavy chemicals but so rapid had been our industrial growth that even in 1910 American chemical production—measured in dollars or in tons—was greater than the combined chemical outputs of England and Germany.

During those years we had made important contributions to the chemical industry. Since colonial times we were—and we are today—world headquarters for naval stores. The discovery of the phosphate rock deposits near Charleston, S. C., and later in Florida and Tennessee had made us world's headquarters on this material, and we lead in the knowledge and application of phosphatic fertilizers. At that period we also commanded the world's markets for methanol and acetate of lime; while the inventions of two Americans—Frasch and Hall—gave us a dominating position in sulfur and aluminum. The first plastic, Celluloid, and the first synthetic abrasive, carborundum, were products the world owes to Hyatt and Acheson, both Americans. Baekeland made the first synthetic resin in Yonkers, N. Y. Goodyear, for vulcanized rubber; Haynes for Stellite, one of the first improved

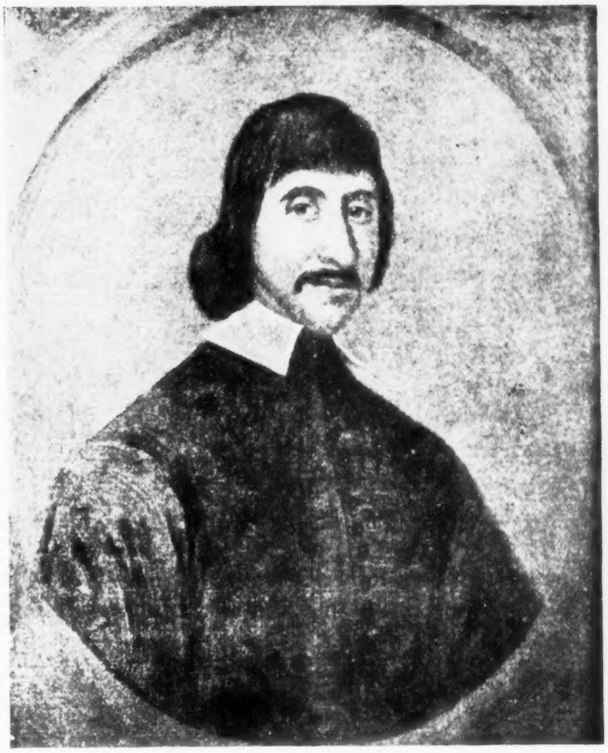
steel alloys; Eastman for photography, are Americans who scored triumphs in chemical processes, for which we all are in their debt.

Despite our enormous industrial chemical industry and these conspicuous chemical discoveries, we lacked in 1914 a coal-tar chemical industry, and we were pitifully dependent on Chile for nitrates and Germany for potash. The World War showed up these flaws in our chemical armour. The nitrates and the potash were monopolies based upon unique natural resources. But the German coal-tar monopoly had been deliberately built and fostered because Germany appreciated that coal tar meant not only dyes and perfumes, but high explosives, poison gas, and essential medicines.

Since the War, with the aid of protection given first by a Democratic Congress and continued under the Republican tariff revision, we have created a coal-tar chemical industry. We have discovered and developed sources of potash in California and New Mexico ample for all our needs. We have built air nitrogen plants that no matter what excessive demands may be made for fertilizers and explosives render us independent of the natural Chilean supplies.

Nor have we been content with declaring chemical independence. We have carried forward chemicals to greater usefulness for all mankind with new products and new processes. From natural gas, a distinctively American raw material, American chemists working in the laboratories of an American company have created a new, truly American branch of chemical industry, producing alcohol and acetone synthetically and giving new solvents, anti-freeze, plasticizers, even a new plastic. Nitrocellulose lacquers and synthetic varnishes are thoroughly American products, as are artificial leather and similar coated and impregnated textiles. Tetraethyl lead, the anti-knock; "F Twelve," the newest refrigerant; Dowmetal, the lightest alloy, are three American post-war chemical developments.

This Foreword is not the place to catalog the full list of American chemical contributions. That is the purpose of this book, and the credit for them should quite properly be associated with the companies which have made and marketed these new materials. The number and the strength of our chemical companies, the extent of their research, and the multiplicity of their products are but a promise of the chemical future, in which better products and cheaper products will come to the service of us all.



Founder of the American Chemical Industry

John Winthrop

THREE hundred years ago—in the autumn of 1635 to be exact—there was set up in Boston a curious chemical establishment which may most rightfully claim to have been the first chemical plant in America. As we know chemical manufacturing, it was hardly a chemical plant at all; but rather a strange combination of druggist's shop, metallurgist's workroom, chemist's laboratory, and alchemist's den. Nevertheless, within it were made experimental batches of alum and saltpeter, and from it radiated a series of primitive industrial enterprises designed to provide the colonists with chemicals, medicines, and gunpowder and to exploit the mineral resources of New England.

Prior to the establishment of this hybrid chemical enterprise, salt had been evaporated from seawater and woodashes had been burned for soap making at both Jamestown and Plymouth, and wine had also been made in the Virginia settlement. At a time when leather was home-tanned and cloth home-spun, however, these were only common household crafts. Bricks and glass and pottery had also been made in America before 1635, but these are process, rather than chemical, industries. To manufacture alum for the home-tanner, and saltpeter from which to produce gunpowder are true chemical operations, governed by economic conditions very similar to the present day chemical industry, undertaken by a man whose experience and point of view were essentially those of the chemical industrialist.

Chemical manufacturing is a complementary industry: it supports other industries. For chemicals are an unique sort of manufactured raw material, employed as tools in reactions with other chemicals or upon all sorts of raw materials from hides and fibres to stones and metals in order to save time or labor, to reduce costs, to improve these materials for human use, even to create synthetic materials unknown in Nature. There is no incentive to make chemicals until other industries are ready to so employ them. Fur-skins were an important, early export of the New England colonies, and the making of alum for curing them was a perfectly logical enterprise. On the frontier of a new continent gunpowder was a double necessity, for food and for defence; and its most costly, most essential ingredient was saltpeter.

Thus from its very inception, the American chemical industry has promoted national prosperity and national safety. Moreover, from the first it has been marked by a characteristic which today distinguishes this ultra-modern, most scientific of all industries.

In a famous definition of chemical industry, John Teeple pointed out that it involves chemical changes resulting in new chemical combinations, and that it handles these changes with chemical intelligence. Unless under chemical control and direction, an operation may be no more a chemical industry than the boiling of an egg by a cook or the slacking of lime by a day laborer, both of which involve chemical changes.

Our first chemical plant was established by a man of real chemical intelligence. Its remarkable mixture of pharmacy, metallurgy, alchemy, and chemistry was a mirror of the diversified scientific curiosity of the day, in which is clearly reflected the many-sided interests of John Winthrop, Jr.

This father of the American chemical industry might well serve today as the very pattern of a great chemical industrialist. Not only was he a courageous and decisive executive; but he was a man of many affairs, a financier, a soldier, a diplomat. He combined to an

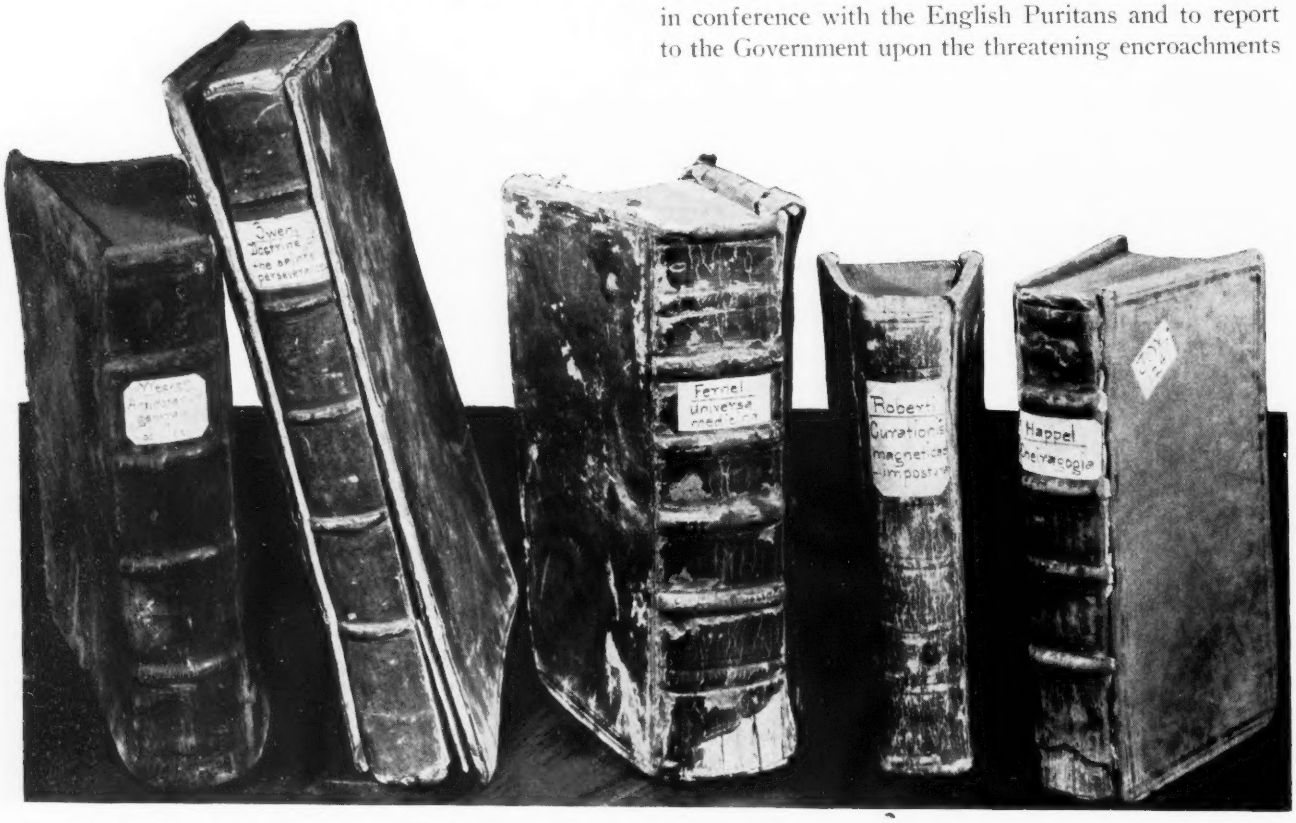
exceptional degree that rare combination of keen scientific interest and sound economic instinct which always makes the ideal equipment for the active head of any chemical manufacturing enterprise.

John Winthrop, the Younger—so he is distinguished from his father—was an industrious member of an important family. Son of the great Puritan leader and Massachusetts governor, he was himself the first colonial governor of Connecticut and later one of the Commissioners of the United Colonies of New England. In his chemical and mining operations, he was financially backed by his father; and as his son, Fitz-John, carried on these enterprises, the distinguished name of Winthrop has properly a high place among such pioneer chemical families as Harrison, Wilder, du Pont, Innis, Rosengarten, Lennig, Grasselli, Lewis, and others long and closely identified with the industry.

The Winthrop ancestral home in England was Groton Manor, near Edwardston, in Suffolk, and here both John Winthrop senior and junior were born. The father, after a brief course at Trinity College, Cambridge, entered the law, which he practiced with success, becoming an attorney in the Court of Wards and Liveries and also being engaged in drafting parliamentary bills. Though he continued to make Groton Manor his home, he was a great deal of the time in London until March, 1630, when, having been elected governor of the Company of the Massachusetts Bay in New England, he sailed for the new world in the *Arabella* in company with a large party of Puritans. An aristocrat in upbringing and taste, strongly conservative in his views, the elder John Winthrop was a mature man when he went through the deep spiritual experience of Puritanism. He quickly became a recognized leader in the Puritan party, and while he frequently opposed the more fanatical doctrines of his fellow colonists, he was the first to defend their political rights from encroachment by the crown and Parliament. His broad views, patience, and courage more than once saved the Massachusetts colony from disaster during its early, perilous years.

The eldest son followed his father to New England in 1631. At the time John, Jr., was a young man of twenty-five with already a brightly colored background. He had been educated at the Bury St. Edmunds Free Grammar School and at Trinity College, Dublin. Like his father, he did not graduate but studied law at the Inner Temple, London. He volunteered for the expedition, raised by the Duke of Buckingham, to go to the relief of the Protestants of La Rochelle, and after the failure of this ill-fated venture, as was the custom of young gentlemen of his day, he went off for a grand tour. He was absent from England till 1629, travelling chiefly in Italy, Greece, and Asia Minor. Two years later he came to Massachusetts to serve as his father's "assistant," an office he held in 1632, 1635, 1640-41, and again 1644-49.

Young Winthrop landed in Boston the 4th of November, 1631, and with that abundant energy that always distinguished his activities soon won in his own right a prominent position in the colony. Within two years, he was chosen to lead the founding of a new settlement at Agawam (now Ipswich), and in 1634 he was sent back to England to represent the colonists in conference with the English Puritans and to report to the Government upon the threatening encroachments



These books, originally a part of John Winthrop's library, are now the proud possession of the Society Library in New York and were exhibited at the American Chemical Society meeting, April, 1935, celebrating the chemical industry's tercentenary.

Title pages of some John Winthrop books with notes on them in his own handwriting. He not only read, but also wrote, Latin—indeed much of his correspondence was carried on in that language, then the universal means of scientific communication.

of the Dutch settlers and the Pequot Indians along the foreshore of Connecticut. The following year, 1635, he returned to Massachusetts, commissioned as Governor of Connecticut for one year from Lords Say and Brook. He sent out a party which built Fort Saybrook at the mouth of the Connecticut River; but except for two short trips, he stayed in Massachusetts and busied himself with his ambitious plans for developing chemical industries based upon the natural resources of the country.

Winthrop returned to England again in 1641 and remained there two years. During this visit he unofficially represented the colonists in a number of negotiations, and he eagerly renewed his friendships among the leading British scientists. In 1645, after his return to Massachusetts, he received the grant of a large acreage in eastern Connecticut and founded there, in 1646, the settlement that became New London. The following year he moved to this new settlement of his and became one of the magistrates of Connecticut. In 1657 he was elected Governor of the Colony of Connecticut and, except for the term of 1658, was annually re-elected until his death sixteen years later.

In 1662 he once more visited England upon a diplomatic mission, the success of which was one of the outstanding triumphs of his long career of public service. He secured from the King the famous Connecticut charter which united the colonies of New Haven and Connecticut and which contained strong and dearly cherished civil and political rights to the people of these colonies. Besides serving continuously as Governor of Connecticut, he was also for many years one of the commissioners of the United Colonies of New England.

In the autumn of 1675 King Philip's War was brewing, and a meeting of all the colonial commissioners was called in Boston. Thither John Winthrop hurried in the midst of an exceptionally bitter winter season during which he contracted a fatal illness. He died in Boston, the 6th of April, 1676, two hundred years, to the very day, before the founding of the American Chemical Society.

Very briefly sketched, the swiftly moving, colorful public life of the younger John Winthrop is for our purpose but the background of his chemical interests and his industrial enterprises. From the time of his very first landing in Boston, he was deeply impressed with the desirability of developing the native natural resources and the importance to the colonists of self-sufficiency in iron and gunpowder. He had not been in Massachusetts a year and a half before he sent back to England for laboratory apparatus, books, and chemicals; and what is likely the very first invoice for any chemical importation into America is a statement to him from his English agent, now preserved among the valuable collection of Winthrop papers in the Massachusetts Historical Library:

	l.	s.	d.
Sandiver 2 lbs and soda 8 lbs	0	5	6
Stone blewing 14 lbs	0	10	0
brimstone 1 cwt	1	3	4
copper ¼ cwt	1	10	4
tin ¼ cwt	1	8	0
Canarie seeds 3 pintes	0	0	9
	4	17	11
paid before for the glasses and the charge of packing them and for 3 catalogues of books	1	18	5
	6	16	4

received in all	9-12-0
paid in all	6-16-4
I rest indebted to you	2-15-8

Copper, tin, and soda are understandable enough. 'Stone blewing' is obviously blue stone (copper sulfate) and 'brimstone' is certainly sulfur. 'Sandiver' has been explained by that capital chemical antiquarian, Dr. C. A. Browne, as being *suin de verre*, sweat of glass, or the scum which forms on the top of molten glass, used by

the alchemists as a constituent of the powder of projection and by the physicians of that time as a cure for gallstones. Canary seeds were also put to medicinal uses in the seventeenth century, being employed as our grandmothers used flaxseed for poultices. Undoubtedly, the 'glasses' were crucibles, alembics, etc., for as in those days balances, compasses, magnifying glasses, etc., were known as 'philosophical instruments' so chemical glassware was simply called 'glasses.'

Plainly then, John Winthrop was from the first not only practicing amateur medicine—he did so with such success that his prescriptions soon became famous throughout New England—but he was also making the best effort that the imperfect chemical knowledge of his time permitted to test out his metallurgical and chemical ideas. Simultaneously, he was building up what was to become not only the first, but by far the largest scientific library in the colonies. Two hundred and seventy volumes from this collection of his are now a part of the rich collections of the Society Library of New York. Among them are works on medicine and pharmacy, philosophy, botany, mineralogy, navigation, physics and mathematics, astronomy, and fifty-two chemical books by such ancient authorities as Paracelsus, Dorn, Basil Valentine, Libavius, and Glauber.

It was when Winthrop returned to Massachusetts after his first visit back to England, in the year 1635, that he set to work seriously to execute his ideas of developing chemical resources.

He had for three years explored the native raw materials available for such enterprises. In England he had consulted with the best chemical authorities and conferred with several practical manufacturers. He tested many industrial opportunities. He mined for lead, tin, and copper. He set up works for making salt, glass, and iron. He produced potash, saltpeter, alum, wood pitch and tar, indigo and other natural dye extracts. He was, moreover, the promoter of the first American chemical stock company, and his prospectus—save for the responsibilities placed squarely in the hands of Providence—is quite in the approved Wall Street style:

> If any desirous to promote a publique good shall see cause to accomodate that businesse with a stock of 3000£ or 4000£ I shall indeavour (God permitting) to raise such commoditee as may be convenient for returnes, and in particular that staple of saltpeter of which some (blank) of tunes are yearly carried into England, Holland, Portugall and other parts; and that no adventure of detriment may be to any, doe hereby ingage that the said stock shalbe within (blank) yeares duly repaied to them, with some convenient consideration (if God please to add a blessing to the designe so farre as it be profitably effected); and when it shall appeare demonstratively incouraging, they may, if they please to joyne in the business and to a further proceeding, advance to a stock of 10,000 or 20,000£ or more.

In 1638 he built and operated salt works on the North Shore of Massachusetts Bay, near what is now Beverley. In 1642, in furtherance of his plans to make gunpowder, he secured the passage of an order of the General Court of Massachusetts decreeing that "as will perfect the making of gun-powder, the instrumental means that all nations lay hould on for their preservation . . . every plantation within the Colony shall erect a hous in length about 20 or 30 foote, and 20 foote wide within on half yeare next coming . . . to make saltpeter from urine of men, beastes, goates, hennes, hogs, and horses dung." At the time of this enactment, Winthrop was in England where, among other missions, he was raising the capital and engaging skilled workmen necessary for the establishment of an iron furnace. This was undertaken at Braintree, Massachusetts, in 1644, and the General Court made a grant of 3000 acres to him and his partners for this purpose.

After he moved to Connecticut, he devoted his energies wholeheartedly to the upbuilding of that colony. He established a salt works at New London and planned to start another iron foundry at New Haven. In 1651 the Connecticut General Assembly issued to him the first monopoly it granted, covering mineral rights so broad and upon terms so generous that had the rocky Connecticut hills been a richer prospecting ground this strenuous and scientifically minded son of the Puritans might well have become a colonial Croesus. His liberal, but not very valuable patent read:

> Whereas in this rocky country, among these mountains and rocky hills, there are probabilities of mines of metals, the discovery of which may be of great advantage to the country in raising a staple commodity; and whereas John Winthrop, Esquire, doth intend to be at charges and adventure for the search and discovery of such mines and minerals: for the encouragement thereof, and of any that shall adventure with the said John Winthrop, Esquire, in the said business, it is therefore ordered by the Court that if the said John Winthrop, Esquire, shall discover, set upon and maintain such mines of lead, copper, or tin, or any minerals, as antimony, vitriol, black lead, allum, stonesalt, salt springs, or any other the like, within this jurisdiction, and shall set up any work for the digging, washing, and melting, or any other operation about the said mines or minerals, as the nature thereof requireth, that then the said John Winthrop, Esquire, his heirs, associates, partners or assigns, shall enjoy forever said mines, with the lands, wood, timber, and water within two or three miles of said mines, for the necessary carrying on of the works and maintaining of the workmen, and provision of coal for the same.

When John Winthrop was in England seeking a charter for his colony, he was elected to the then recently organized Royal Society, and on July 9th, 1662, he read to its distinguished members the first scientific paper ever prepared by an American. His title was "Of the Manner of Making Tar and Pitch in New England," a practical, industrial subject which he handled capably upon the basis of his own experience. He contributed companion papers on the preparation of potashes and black lead. He also exhibited his collection of American mineral and vegetable products and carried on a demonstration of brewing beer from American corn, accompanied by a paper, "Description, Culture, and Use of Maize." After his return to America, he continued to send back papers on a variety of chemical subjects to be read at the meetings of the Royal Society, and till his death he carried on constant, voluminous correspondence with his scientific friends.

He lived just at the time when the revival of scientific

Courtesy, Grasselli Chemical Co.

knowledge was stirring England. The transition from the alchemy of old to modern chemistry—a change which he appreciated more fully than many of his contemporaries—fascinated him. His restless, pragmatic mind transmuted the new discoveries of chemistry into workaday problems, and we find him continually discussing how some new fact found by experiment might serve some good human use. His alert appreciation of the needs and opportunities of the colonists naturally suggested to him the possibilities of exploiting the mineral resources of New England, and to this end he quite naturally applied his knowledge of chemistry. In spirit, as in fact, he was the founder of the American chemical industry.

His own ventures in this field did not win the material success that his vision, his courage, his persistence merited. He was thwarted by conditions beyond his control. The mineral resources he sought to exploit were not sufficiently rich to justify working. The chemical operations he attempted to carry on had not been sufficiently perfected for economical operation on the edge of the American wilderness. The chemical markets he attempted to supply, though they represented real needs, were not sufficiently large or diversified to support a real chemical production. Accordingly, he failed to establish permanently any profitable chemical or mining enterprise. Nevertheless, his pioneering effort was no sporadic, hit-and-miss "trial." It was a forward-looking, chemically intelligent effort, and John Winthrop, Jr., did more than blaze a chemical trail. In a very real sense he cleared land and built a chemical outpost on the first American frontier.

The Past Fifty Years

Reminiscences of Two Chemical Generations

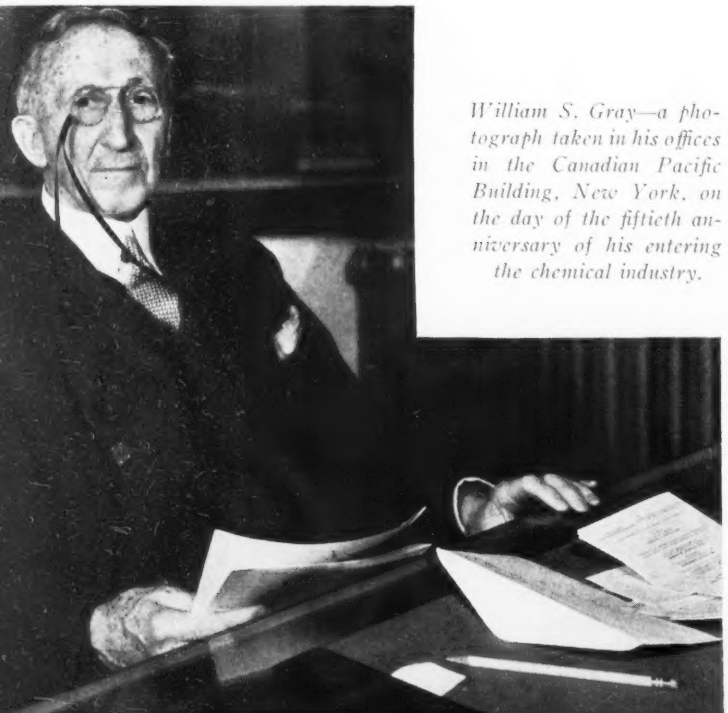
By William S. Gray

Chairman of the Board, William S. Gray & Company

ALMOST any anniversary is sufficient excuse to start a man past sixty reminiscing. The three hundredth anniversary of the founding of the industry in which I have spent more than fifty busy years is a great temptation, especially so since these have been eventful years of great importance in the chemical development of our country. I have lived through exciting and significant changes in our business, and what I can remember may not be inappropriate or uninteresting.

First, let me pay my compliments to this issue of CHEMICAL INDUSTRIES celebrating the tercentenary of the American Chemical Society. I have watched this paper grow from a little pamphlet called "Drug & Chemical Markets" twenty years ago to an influential industrial magazine, and I admire its courage, not only in its outspoken support of whatever it believes is for the best interests of our American chemical industry, but also because it has been able to adapt itself so readily to the changing needs of its readers.

It is this same ability to meet changed conditions that impresses me most as I look back over two generations of chemical business.



William S. Gray—a photograph taken in his offices in the Canadian Pacific Building, New York, on the day of the fiftieth anniversary of his entering the chemical industry.

When, as a boy, I got a place in the office of a chemical broker, the streets of New York were paved, if at all, with cobblestones; not the neat, square Belgian blocks, but round stones with lots of mud in between. We had no typewriters, no telephones, no women clerks in the offices. The hours were from 8 A. M. to 6 P. M. The "heads"—and they were real "heads" in those days—drove to work behind high-stepping hackneys. They wore silk hats and frock coats to dingy offices. But they knew every detail of their business; and if they were strict taskmasters, they taught thoroughly.

Business was then more simple, and our contacts were more personal. There were no big corporations, no conferences of executives, no conventions, no technical selling, no reciprocity contracts, but competition was just as keen as it is today. On the whole, our modern ways are better; but do not think that in that bygone age of industrial individualists business was slow and easy-going. It was big, hard-fought, profitable business.

Out of those now-vanished conditions I have brought the memory of long-standing friendships. It is a real and pleasant memory to have known well such men as William H. Nichols, Caesar Grasselli, J. L. and D. S. Riker, John D. Wing, Adolph Kuttroff, Edward Hill, and many others. They were good men to do business with, men who made decisions promptly and abided by those decisions rigorously. They were men of integrity and character.

Looking back on the changes that have revolutionized the wood chemical branch of our industry, the branch I have served by having sold, personally, several hundred million dollars worth of acetate of lime and methanol, there stand out in memory, as of paramount effect, two types of changes. These are changes in technique and changes in laws.

The first technical change in wood distillation has been forgotten by most of us. It came in the early eighties when M. F. Quinn, a practical wood distiller without formal scientific training, invented an iron

buggy for charging wood into a vertical retort. This made wood distilling an almost continuous operation. It raised the efficiency and largely increased the output of the wood chemical plants.

Of necessity this industry is composed of comparatively small units, widely scattered; and in a broad sense, the economic service I have rendered has been to create a centralized selling agency, in touch alike with producers and consumers, and so able to balance supply against demand and keep prices within reasonable control. This entailed a grave responsibility alike to sellers and buyers, and it carried too the necessity of assisting distillers to finance their wood converting operations, just as the rural banker finances the farmer from season to season.

Wood distilling is one of the oldest of our native industries, and until quite recently it was the dominating factor in world supplies of raw material for the manufacture of acetic acid and for that most useful solvent, methanol. Another technical change has upset this situation, but it cannot destroy the strong economic position of an efficient wood distillation plant. Here is the ideal exponent of a decentralized, local industry working up a waste product.

Loading a modern wood distillation kiln; the modern type of buggies used in what has become a virtually continuous chemical operation.

The wood distillers have been criticized for not having foreseen the coming of synthetic methods of making acetic acid and methanol. They have been considered unprogressive because their research chemists had not forearmed them to combat these synthetic processes. You might as well blame the railroads for not having invented the motor bus or charge the automobile manufacturers with being unprogressive because the airplane is not a product of their research laboratories. The wood distillers had no more business with the fermenting bacteria, *Clostridium acetobutylicum*, or with the electric carbide furnace, or with ethylene from petroleum or gas, than with cheese or chalk, or the other side of the moon. Such accusations are unreasonable, quite as unreasonable as the notion that wood distillers ought to be or can be killed off by synthetic products. They are adapting themselves once again to changed conditions.

As to changes brought about by law, they are of a different order from technical developments. Their effects are apt to be alarming but often temporary.

Before the passage of the tax-free alcohol law, for example, methanol had what amounted to a real subsidy.

Primitive type of "bee hive" wood distillation kiln, in which all of the by-products went to waste; a battery at Carp River, near Marquette, Mich.

The alcohol tax, which was then $2 a gallon, was a decided price advantage when alcohol and methanol met as solvent competitors. Without that price advantage it would have been a longer, harder task to introduce methanol into many fields. When that price advantage was wiped out, and they were put on an even basis, many prophesied the doom of the wood chemical industry.

Again, during prohibition, methanol became the victim, not the favorite, of a law. Branded, and outlawed even from its most logical and legitimate use, as a denaturant for ethyl alcohol for industrial purposes, and so recognized in every other industrial country in the world, the fate of methanol seemed sealed. But today it has more diversified markets than ever before.

Accordingly, I cannot but question most of our recent legislation aimed at creating markets, supporting prices, or controlling production. I know very well such laws can turn normal business upsidedown. For a time they can make or break the soundest plans and the most logical programs. But in the end the law of supply and demand will prevail.

In the chemical industry we know only too well that nothing can thwart progress. We have to meet rapid, continual, and radical change. Indeed, we have come to accept change as the one constant condition with which we must be prepared to deal.

Grassellí's Story

of Their "Chemical Contribution to the Nation"

THE Grasselli Chemical Company has not only fostered chemical manufacturing and consuming industries, but has been closely allied with the development of the chemical profession.

Early technical pioneers were afforded ample excitement through difficulties in securing and maintaining equipment, transporting raw materials, production problems, and the financial difficulties of the time.

The skill and courage of America's technical ancestors will always be an inspiration to the present and future generations of technical men.

One of the outstanding pioneers behind the technical, economic, and social development of the Cincinnati region was Eugene R. Grasselli, founder of The Grasselli Chemical Company. His father, Jean A. Grasselli, was the first manufacturer to utilize Sicilian brimstone in making sulfuric acid in the old world. His plant was near Mannheim, Germany.

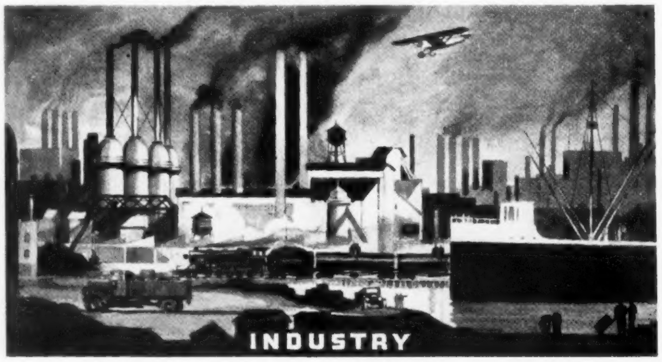
In April, 1839, Eugene Grasselli started to produce sulfuric acid at Cincinnati.

Cincinnati boasted a population of about 42,000 inhabitants; railroad connections were not available; and the country was plunged into a business depression. Despite these handicaps the new Grasselli industry expanded: and other acids, soda ash, and alum supplemented the sulfuric acid production.

In 1866 another plant was built at Cleveland to more advantageously supply large quantities of sulfuric acid then required by the refiners of petroleum.

As industrial growth increased and new processes and products developed, Grasselli produced chemicals to meet these demands. Nitric and mixed acids were added to the Grasselli line about 1877.

Since that time Grasselli has produced many new chemicals, some of which are used in an almost countless number of products; others are more specialized. Chemicals are now produced which are used by such industries as textile, paper, paint, rubber, battery, glass, sheet iron, tin plate, steel, domestic appliance, and a great number of others.



About sixty years ago, silicate of soda was used in relatively small quantities in the manufacture of laundry soap. This product is now used so widely in industry that it enjoys an annual consumption of more than one billion pounds. Two of its uses are the sealing of fibre containers and the curing of concrete.

Many products have been developed through research to supply specific needs found in America's vast economic structure. In the improvements in preservation of wood structures, zinc chloride has played an important part, and a new product, chromated zinc chloride, shows promise of still further advancement.

One of the most recent developments in the production of metals such as iron and steel has been that of cadmium plating. This form of protective coating possesses ductile properties which permit drawing, bending, stamping, or welding into required shapes and sizes. Possessing in addition an attractive finished appearance, cadmium plating has come to be used on many well-known products such as hardware and automobile parts.

Another recent development has been a method of recovering indium, a rare metal as yet so unexploited that no practical, commercial use has been developed. Yet, industry might demand indium tomorrow.

The Grasselli Chemical Company have seen the growth of hundreds of industries since the erection of their first chemical plant in 1839. As these industries develop, they require new, improved chemicals which will have to be supplied. Through their research laboratories the Grasselli Chemical Company meets these conditions and produces chemicals as they are required.

Salt Lime Coal to Alkalies

CHEMICAL self-sufficiency is the cherished ambition alike of countries and of companies. Since the World War many nations, appreciating fully the importance of chemicals to national defence and industrial activity, have achieved chemical independence. Because of the size and complexities of modern chemical manufacturing many mergers designed to bring under single control a whole chain of chemical operations, from raw materials to consumers' products, have been effected.

A great chemical enterprise, antedating yet forecasting these ultra-modern tendencies, whose processes are, however, chemically simple and upon a vast scale, furnishes a telling example of the value of chemical self-sufficiency alike to the producer and the consumer. As an example, the story has the great advantage of simplicity. For the Michigan Alkali Company, though a giant among our chemical producers, is not manufacturing a fancy line of complex organic compounds by processes involving chemistry beyond the layman's comprehension. Though their operations require care and skill, expert experience and technical control at every step—if the high quality and the absolute uniformity which are their justified pride are to be maintained—nevertheless the products are all large tonnage items extremely important to chemical users in a wide range of industrial fields. They are soda ash, caustic soda, sodium bicarbonate, calcium chloride, and solid carbon dioxide. Without these chemicals the glass, soap, paper, textile, baking powder, rayon, petroleum, and refrigerating industries (to say nothing of the chemical industry itself) could not operate.

Above, taking out limestone at the Alpena, Michigan, quarry of the Michigan Alkali Company; the first step of their self-contained production of alkalies from raw material to container. To the left, the breaker house and loading station at one of the company's three coal mines, supplying another essential raw material to their operations.

The pattern room in the work shop of the Michigan Alkali Plant, at Wyandotte, Michigan, where the company is equipped either to repair a cracked drum head or build a new operating unit.

Salt is the cornerstone of the ammonia-soda process which the Michigan Alkali Company works. And their plant at Wyandotte, Michigan, stands literally on top of a salt bed 250 feet thick. Under an acre of the company-owned land is some 10,880,000 cubic feet, about 640,000 tons of salt. The company has at present 26 salt wells, each of a very long average life. Their salt supplies are assured until the chemical industry shall be celebrating its 450th anniversary in the year 2085.

The initial step in their manufacture of alkalies from salt is to treat salt brine with ammonia gas to produce ammonium bicarbonate. The most economical way of producing ammonia is as a by-product from coking, which also produces the most economical fuel for steam and heat. Accordingly, the company not only has its own battery of modern Kopper's coke ovens, but also owns three coal mines. These produce more than company requirements and the excess, as in the coking operation, is sold. These mines are situated in Pennsylvania on the Bessemer road but a short haul to the lakeport of Conneaut, thence by boat to their own docks on the Detroit River at the Wyandotte plant, or to their own docks at their Alpena lime quarries on Lake Huron.

The coal piles; loading dock with the lime kilns in the background at the Wyandotte plant.

In order to supply the raw material for the next step in their production of alkali, the Michigan Alkali Company own their own limestone deposits of 600 acres extent, estimated to run about 272,000 tons to the acre. For the carbonating stages of the soda ammonia process at the two chemical plants at Wyandotte, for the cement plants at Wyandotte and Alpena, for outside sales to a few big industrial consumers, the company is mining and shipping about 2,000,000 tons of high test chemical lime each year. At this rate of production, their limestone reserves are good for at least sixty years.

At the Wyandotte alkali plant, the ammoniacal brine (consisting essentially of ammonium bicarbonate) flows down tall towers, meeting a counter-current of carbon dioxide gas which produces sodium bicarbonate and ammonium chloride. The sodium bicarbonate is washed and filtered out of the ammonium chloride solution, and then either purified and sold or calcined to sodium carbonate (soda ash), carbon dioxide, and water. The ammonium chloride solution, treated with lime, regenerates the ammonia, which is also recovered from the flue gases of the carbonating tower.

A final step is the causticizing of the soda ash, which is accomplished by treating the sodium carbonate liquor with lime, when calcium carbonate settles to the bottom and the caustic soda in solution is evaporated in iron pots. Again lime has entered the operation and re-emphasized the importance of a control of lime supplies.

There are two interesting side steps in the operation of the soda ammonia process at Wyandotte by the Michigan Alkali Company. These produce two valuable by-products.

In the filtrate from the bicarbonate at the first major stage of the main process is ammonium chloride, which is treated to liberate the ammonia for recovery with lime and produces calcium chloride. This, in concentrated solution, is the "brine" of the commercial ice plants, or evaporated to dryness finds a growing market as a dust layer.

The lime kilns at Wyandotte recover more carbon dioxide than needed, and for the past five years this has been compressed to the solid form, known popularly as "Dry Ice," into 10 inch squares, weighing 55 pounds each.

The advantages of the soda-ammonia process are obvious. It produces a clean, white soda ash and both bicarbonate and caustic that are purer than by any known operation. The recovery of ammonia is very efficient and the by-products, carbon dioxide and calcium chloride, are marketable commodities—both with growing uses—that can be recovered quite economically.

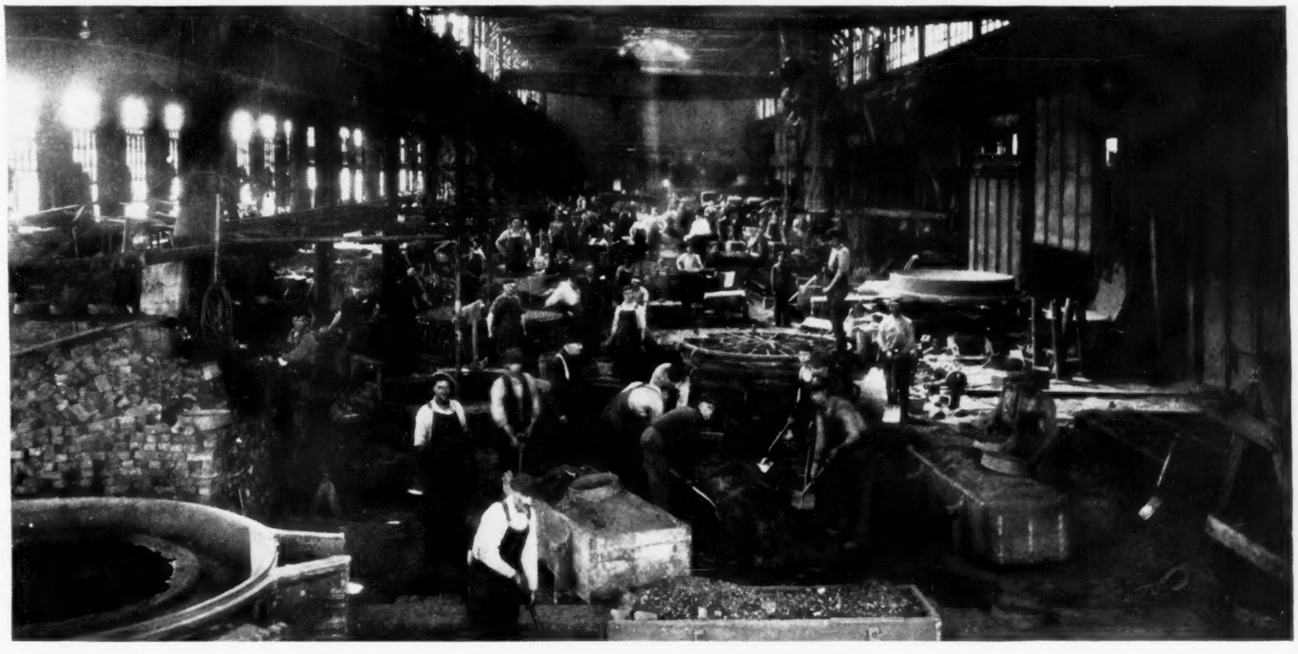
Fitting into this operation are two others: the production of coke and of cement, both of which are successfully carried on. In fact, it is probably a surprising fact to many chemical consumers to discover that the cement branch of the Michigan enterprise is as large as the alkalies, and that the lime quarrying and coal mining operations are themselves big businesses. This diversity of great tonnage industrial materials, controlled at the source, makes a deep and solid foundation upon which to build.

Moreover, these diverse operations are concentrated and specialized. Michigan Alkali possesses but one great chemical plant, split, it is true, into two units, but both located together on the banks of the Detroit River. In their own boats—the fleet of seven modern lake steamers is operated by two subsidiaries, the Wyandotte Transportation and the Huron Transportation Companies—they bring lime down Lake Huron and coal up across Lake Erie. Recently the Company has added to these shipping facilities five dieselized barges, making for prompt, cheaper shipment through canal to the seaboard. The great twin plants at Wyandotte, the heart of the enterprise, are built right on top of the salt supply.

Unloading their own coal from their own steamer to their own dock.

It was, of course, this salt deposit that led to this location when, in 1892, the first plant was built. Two closely adjacent blocks of land are owned. The site of the South Plant comprises 40 acres, and that of the North Plant 250 acres.

The pioneer plant (pioneer alike to the company and the industry) was burned in 1898, the very year a second plant had been erected on the southern plot. The original plant was promptly rebuilt, and both these



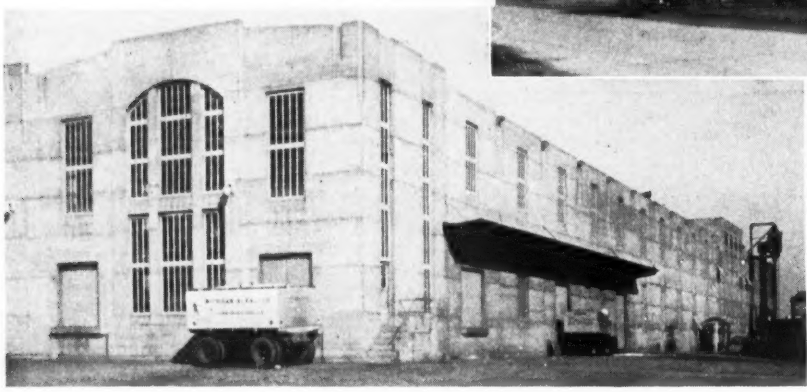
The foundry at Wyandotte, Michigan, where all of the piping and kilns, except the copper ovens and motors, are built, and through which one hundred per cent efficiency of maintenance is assured.

operations of the last century have since been again rebuilt.

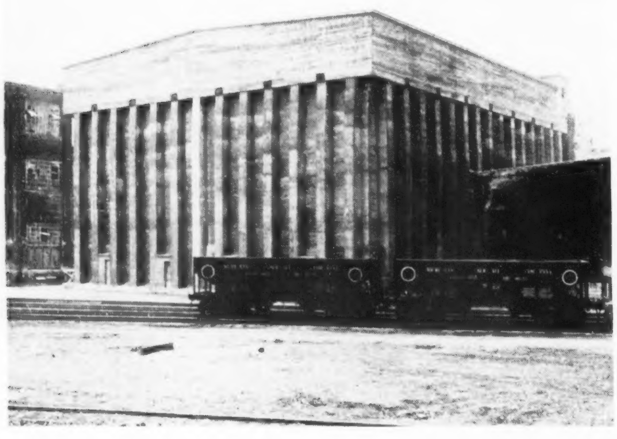
In fact, the new North Plant, completed but a few years ago, upon the basis of forty years practical alkali making experience, is the largest single ammonia-soda unit in the world. It stands on 12,000 fifty foot piles, driven to bed rock. Into its making went over 10,000 tons of steel and 500,000 bags of cement. It has a total of 42 miles of piping, inside and out, and it daily pumps 40,000,000 gallons of water. It is a striking fact that the combined Michigan operations daily use 140 million gallons of water, or as much as the whole population of the city of Cleveland.

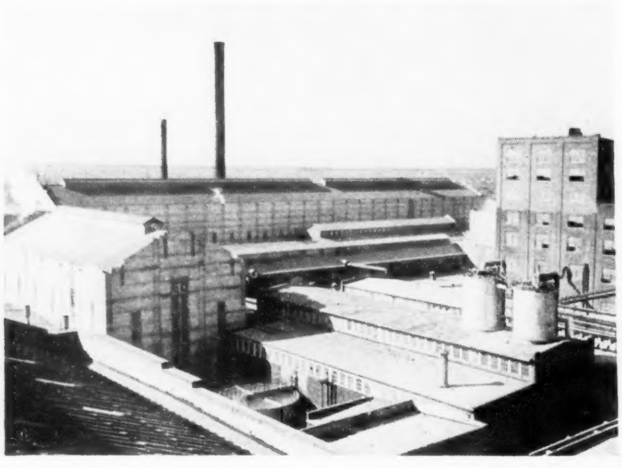
The two most striking features of this titan among alkali plants are, however, the stock piles along the river and the great skyscraper that dominates the group of buildings. Mountains of black coal and white limestone, lifted out of the long, low-waisted lake vessels, by great mechanical cranes, over the docks and rails, and piled high for storage, are a sight, once seen, never to be forgotten. A towering concrete plant, twenty-one stories high is as unique a factory spectacle. From the top of this industrial "Empire State" the city of Detroit fills one horizon while to the south lies the companion plant. Beneath one is the greatest alkali plant in the world, from the black battery of coke ovens at one side to the window-filled oblong that is the new "Dry Ice" plant, with the lime kilns and the cement plant and square bicarbonate unit in between. Skirting the whole is the silvery ribbon of the Detroit River, with the company owned Fighting Island where the waste lime sludge is dumped. Away from the river, fronting on the concrete highway, are a towering warehouse, the neat brick office building of the J. B. Ford Co., specialists in cleansing alkalies, and the dignified Victorian administration building, the heart of the whole enterprise, housing the operating officials and the research staff.

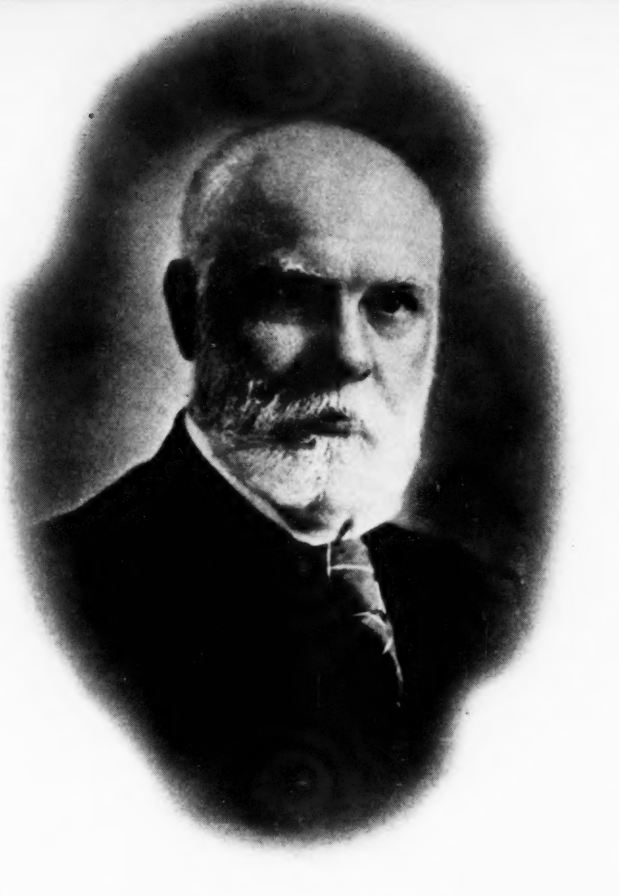
To the right, the great cluster of the main buildings at the North Plant, at Wyandotte, the center building of which equals the height of a twenty-one story office building; and below, the recently completed "Dry Ice" plant, showing the insulated motor trucks used for the local delivery of this new product.



Lower left, not a Greek temple but the storage warehouse. Below, a view of the plant taken from the top of the tall building above. In the background of this view is the bicarbonate unit of the plant.







Martin Dennis, President 1893-1916.

Chemical First Aid to the Oldest Art

Tanning Specialties Produced by The Martin Dennis Company for Almost Half a Century.

INSTITUTED to serve the oldest art known to man, that of preserving and rendering useful the skins of animals, The Martin Dennis Co. has served the tanning industry for forty-two years. In 1893 Martin Dennis, confident in the truth of the principle he had conceived, in association with his life-long friend, Harry E. Richards, chemist and physician, to whose acumen in both business and science the success of the company is in no small measure due, organized The Martin Dennis Chrome Tannage Co. Since that time it has grown steadily until today it owns and operates two large plants, both located in New Jersey, one at Newark and the other at Kearny, manufacturing a comprehensive line of products, recognized throughout the world as standards of quality, serving the tanning, textile, electro-plating, oil, and chemical industries.

Martin Dennis, whose name the company bears, graduated from Princeton University in 1873. He then entered the College of Physicians and Surgeons at New York, but, before completing his studies there, reverses caused him to seek employment. He took a position with his uncles, Rose, McAlpin & Co., Tanners, of Yonkers, N. Y., the tanning industry appealing to Dennis because of his appreciation of the great value of leather to the human race and his deep interest in chemistry, especially physiological chemistry. As a result of his training and interest he was a pioneer in the application of scientific principles to the manufacture of leather.

During the course of Dennis' employment with Rose, McAlpin & Co. the chrome tanning of leather began to arouse interest among tanners. In 1884 Augustus Schultz patented a process for chrome tanning. His method, known as the "two-bath process," consisted of impregnating properly prepared hides and skins with acidified dichromate followed by reduction with a suitable reagent, whereupon the fixation of chromium, or tanning, took place. Dennis firmly believed that such a violent chemical reaction within the sensitive hide fibre was not the best treatment for it, and that logically the necessary reduction, a purely chemical process, should be carried out in a chemical plant. The product

Plant No. 1, Newark, N. J.

Plant No. 2, Kearny, N. J.

"Tanolin" resulting from this conception was patented in 1893, from which date the chrome tanning of leather became a commercially successful process. Martin Dennis pioneered this process both in this country and many important tanning centres abroad, thus contributing to the industry one of the greatest advances in its history.

Before the advent of chrome tannage, leather was lubricated and given strength by the application of oils in the raw state. Chrome leather, however, would not assimilate raw oil, and consequently its manufacture was retarded until this difficulty was overcome by the discovery of the fat liquor, or emulsified oil, for which credit must go to Robert Foerderer of Vici kid fame. It was Martin Dennis, however, who recognized the real importance of the fat liquor and who first produced a commercially available fat liquor, thereby making possible the process of tanning with chrome and subsequent lubrication of the fibre.

In his travels about the world Dennis made many friends in the tanning industry, among whom was Joseph T. Wood, of Nottingham, England. Wood shared with Dennis the disgust at the filth and uncertainty in the use of dog, chicken, or pigeon manures as bates and sought to dispense with them by the use of chemical substances for the removal of lime from skins and various other media for softening or depletion. Bacterial cultures were tried but could not be marketed commercially and could not be controlled in use. As a result of much discussion and research, combined with his knowledge of phsyiological chemistry and the processes of digestion within the body, Dennis developed a bate containing enzymes. This bate was stable and unchangeable in shipment and in storage, uniform in results produced, and, above all, clean and sanitary. This bate, originally known as "Puerine," constituted the first commercially successful artificial bate.

Thus, with a background of intelligent conception, intense research and high purpose The Martin Dennis Co. has served industry for almost half a century. To these same high principles of its founders it has always adhered, and to them its present management is dedicated.

Harold Dennis, President.

In this laboratory Martin Dennis Co. carries on specialized research on tanners problems.

Harry E. Richards, President 1916-1923.

MALLINCKRODT CHEMICAL WORKS 1867

Fine Chemicals Since 1867

Chemical Manufacturers following close in the wheel-tracks of the prairie schooners, Gustavus, Otto, and Edward Mallinckrodt were real pioneers

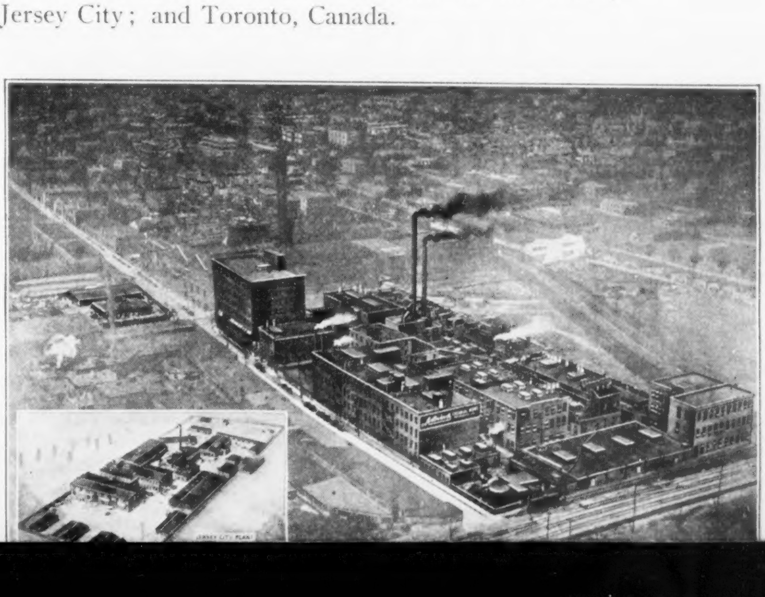
THE Mallinckrodt Chemical Works was established in St. Louis in 1867 by three brothers: Otto, Gustavus, and Edward Mallinckrodt, under the name of G. Mallinckrodt & Company, for the manufacture of fine chemicals. At that time a few fine chemicals were manufactured in the East, but the majority were imported from Europe. The first plant consisted of three small buildings located on the site of the present main plant in north St. Louis. Some of the items produced were bromides, bismuth salts, mercury salts, C. P. acids, and acetic and butyric ethers. With the growth and expansion of the population of the country into the west and southwest, the demand for chemicals increased and the small company grew and prospered. In the early 80's the name of the company was changed and the firm incorporated as "The Mallinckrodt Chemical Works" with Mr. Edward Mallinckrodt as president; the brothers, Gustavus and Otto, originally associated with the company, having died a few years previously. Edward Mallinckrodt continued active in the company's business until his death in 1928. His son, Mr. Edward Mallinckrodt, Jr., is at present the Chairman of the Board of Directors.

Starting out as a manufacturer of fine chemicals, the Mallinckrodt Chemical Works has adhered strictly to that field, believing that by doing one thing it could be done well. The line has been expanded gradually. In 1883 photographic chemicals were added to the list and in the late 90's the manufacture of the alkaloids, cocaine and morphine, was begun. A little later the manufacture of the products of nut galls: gallic acid, tannic acid, and pyrogallic acid, was started until today over 2000 fine chemicals are produced—representing the most complete line of fine chemicals for medicinal, photographic, industrial, and analytical purposes of any manufacturer.

From the start the business was built on quality and service and the name of Mallinckrodt has come to be synonymous with the best in fine chemicals. Modern factory and laboratory facilities make possible the continued production of chemicals worthy of the Mallinckrodt name. Extensive research laboratories are maintained, manned by able chemists. These laboratories are constantly improving methods of production and collaborating with scientific investigators in various fields to produce new products and improve old ones.

Among the recent accomplishments of the research laboratories is the improvement that has been made in ether for anesthesia. The quality and the method of packaging this product have been improved to such an extent that the ether that is now marketed for anesthetic purposes is of a grade comparable to the high purity specifications of the reagent chemicals that are used in the analytical laboratories. In collaboration with leading medical authorities the products, Iodeikon (tetraiodphenolphthalein sodium) and Hippuran (sodium ortho-iodo-hippurate) for use in X-ray diagnosis, have been developed. The facilities of these laboratories are available for consultation regarding chemical problems.

As early as 1884 a sales office was established in New York City, and an additional factory was erected in Jersey City a few years later to supply the growing demand for Mallinckrodt products in the eastern market. Today The Mallinckrodt Chemical Works is serving the chemical trade through sales offices in St. Louis, Chicago, New York, Philadelphia, Montreal and Toronto, Canada; and factories located in St. Louis, Jersey City; and Toronto, Canada.



A PIONEER IN THE MANUFACTURE

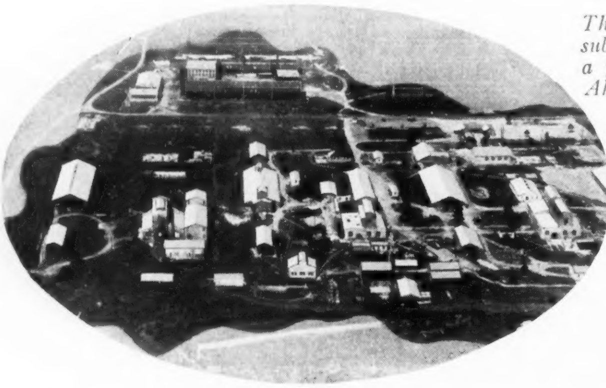
Monsanto Chemical

THE Monsanto Chemical Company was founded by John Francis Queeny at St. Louis in 1901 to engage in the industrial phases of synthetic organic chemistry. At the time, this branch of the American chemical industry was in its infancy and dependent upon foreign sources for raw materials, skilled personnel, special equipment and machinery, and even for manufacturing processes. Under such conditions, the founder of Monsanto undertook to manufacture a line of medicinal products and fine chemicals which until that time had been mostly imported.

The company's first product was saccharin, an American discovery, but until Monsanto's entry manufactured principally in Germany. One product after another was added to Monsanto's list, including in the approximate order undertaken, vanillin, chloral hydrate, caffeine, glycerophosphates, phenolphthalein, coumarin, and acetphenetidin. Later there followed salicylic acid and the salicylate group of medicinals, including acetylsalicylic acid. Each new product met with conflict from European manufacturers.

Portrait of John Francis Queeny (1859-1933) in the president's reception room of Monsanto's administration building in St. Louis.

In synthetic organic chemical manufacture in this country, we are prone to consider the year 1914 as the date of the "creation." By that time, however, Monsanto's founder had gathered about him a staff of experienced men, and the foundations of the business which today is international in scope had been well laid. The war, nevertheless, was a severe test. Many of Monsanto's operations were carried out with imported intermediates, equivalent to buying materials half made and finishing them. Monsanto was not only forced to make these imported intermediates for her own products but was called upon to meet the demands of American manufacturers in many lines for a large number of synthetic organic chemicals which had hithertofore been imported. Monsanto was



The plant of Rubber Service Laboratories Company, a subsidiary, is located at Nitro, W. Va. This plant makes a full line of rubber chemicals. Offices are located at Akron, O.

Almost directly across the Mississippi River from Monsanto's St. Louis plant is the company's Monsanto, Illinois, plant, located in the incorporated village of Monsanto, which offers unusual industrial advanages to manufacturers. This plant supplies a large share of the demand of the Mississippi Valley for industrial chemicals such as sulfuric and other heavy acids. The Monsanto, Illinois, plant also furnishes the St. Louis plant with essential basic chemicals. The plant is a large producer of phenol, an important base of synthetic resins, as well as dye intermediates. It is ideally situated for expansion, and has the advantage of water and rail transportation for its bulky raw materials such as salt and sulfur.

The principal plant of Monsanto's British subsidiary, Monsanto Chemicals, Ltd., is located at Ruabon, North Wales. Before acquisition by Monsanto, the original plant specialized in the manufacture of standardized grades of cresylic acid. Under Monsanto, the old plant has been modernized and enlarged and its operations increased. A number of Monsanto processes for the manufacture of fine and medicinal chemicals were installed, and the Ruabon plant now supplies a good share of the British Empire and European trade with these products. The executive offices of the British subsidiary are in London.

OF SYNTHETIC ORGANIC CHEMICALS

Company, St. Louis, U. S. A.

able to meet her own needs and those of American industry. Expansion in operations, products, and facilities followed and many new products better suited to the needs of industry were developed.

Edgar Monsanto Queeny, President and active head of Monsanto since 1928.

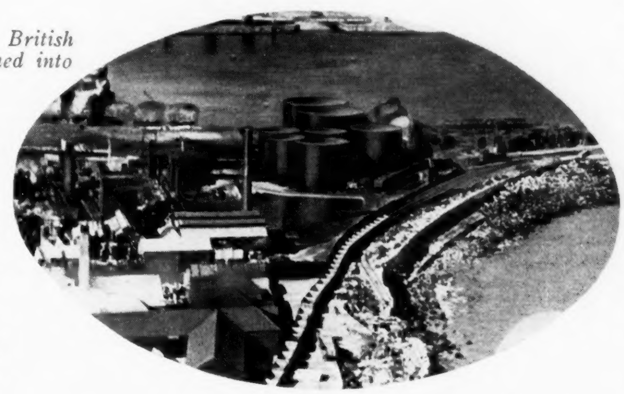
Today Monsanto is one of the world's largest producers of synthetic organic chemicals. The company is also a large producer of heavy chemicals such as sulfuric, muriatic, and nitric acids. Its products are used by practically all industries including such important ones as steel, rubber, textile, agriculture, pharmaceutical, paint, petroleum, food, leather, and paper.

From the beginning, research has played an important part in Monsanto's development. Today five strategically located plants in this country and two abroad transform its laboratory achievements into volume production. Each plant is so located that it is dependent on outside sources only for basic raw materials, and products, therefore, are synthesized completely.

The Monsanto Chemical Company is both a holding and operating company with plants at St. Louis, Mo., and Monsanto, Ill. (near East St. Louis, Ill.). It owns all the stock of four subsidiary companies, the Merrimac Chemical Company, Inc., Boston, with plant at Everett, Mass.; Monsanto Chemicals, Limited, London, with plants at Ruabon, North Wales, and Sunderland, England; Rubber Service Laboratories Company, Akron, Ohio, with plant at Nitro, W. Va.; and Virginia Fertilizer Company at Norfolk, Va.

Monsanto owns a controlling stock interest in the Swann Corporation of Birmingham, Ala. The Swann plants are located at Anniston, Ala.; Camden, N. J.; and St. Louis, Mo. Monsanto also owns a majority stock interest in the New England Alcohol Company with plant at the Everett works of the Merrimac subsidiary. An affiliate company, Monsanto Petroleum Chemicals, Dayton, Ohio, is engaged in the field of aliphatic chemistry.

The Sunderland, England, plant of Monsanto's British subsidiary receives crude coal tar which is refined into various coal tar products.



Advantageously located at Everett, Massachusetts, on the banks of the Mystic River which is navigable by ocean-going vessels, is the plant of a Monsanto subsidiary, the Merrimac Chemical Company, the oldest chemical company in New England. Since acquisition in 1929, Monsanto has rebuilt and enlarged the Merrimac plant, making it one of the most modern and efficient anywhere. The Merrimac subsidiary has long been a large supplier of chemicals to the textile, leather, paper, and other of the diverse industries of New England. It also is an important factor in the field of lacquers, solvents, and specialty coatings. At the Everett plant is located the New England Alcohol Company, a Monsanto controlled affiliate.

In the heart of industrial St. Louis is located the home plant and general offices of the Monsanto Chemical Company. Here, in 1901, John Francis Queeny started the manufacture of saccharin and laid the foundations of the company which today operates five plants in the United States and two abroad. Monsanto's St. Louis plant is one of the largest in the world engaged in the synthetic production of fine and medicinal chemicals. The principal raw materials of this plant are obtained from coal tar. Monsanto's main research laboratory adjoins the St. Louis plant.

Casein

THE real commercial development of casein in the United States may, we believe, be said to have started during the last few years of the 90's. Small amounts of casein were made and used previously but in a very limited way. The large development consisted of not only persuading creameries to make casein but also the bringing of the various lots together. Treating and compounding to produce uniform products was done at Bellows Falls, Vermont, by those who later merged into what is now The Casein Manufacturing Company of America, Inc., with offices at 350 Madison Avenue, New York City. In those days the sale of 1,000,000 pounds of casein in one year was considered very good business, and it was hoped that sales to that extent would continue.

During this period of development the manufacture of the crude casein at the creamery may have improved somewhat over the manufacture in the earlier days; but due to uncontrollable factors such as variation in the quality of milk from day to day, slight changes or variations in the manufacture of the casein, and many other factors, it is still almost impossible to secure uniformity of product direct from creameries. The users of casein must, therefore, turn to the manufacturers and compounders of the product who by years of experience, by very careful chemical control, and by an immense amount of chemical research are able to supply uniform qualities as regards both physical and chemical characteristics. Casein with special qualities can be furnished on short notice.

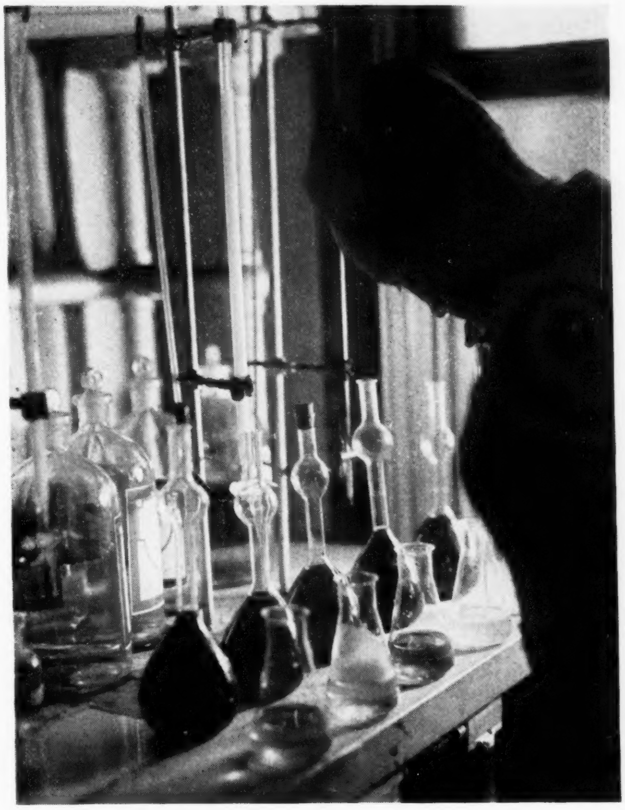
The largest single user of casein is still the paper-coating industry. Prior to the introduction of casein, paper coaters used animal glue for an adhesive or size to glue to the surface such pigments as clay, blanc fixe, and satin white in making high-grade book paper, lithograph paper, friction glaze and flint glaze papers. Years of intensive introductory service as well as great patience and persistence were necessary before paper-coating plants fully surmounted the difficulties which the use of casein presented.

The superiority of casein over animal glue, however, was very apparent. The non-jelling properties of casein solutions, when cold, permitted the coater to use much less care in watching the temperatures of his various coating mixtures not only in preparing them but also in applying them to the paper. Using casein and small amounts of formaldehyde it was also possible to make water-insoluble coatings—a great advantage from many standpoints. When the coated paper was packed, even under damp conditions, there was no tendency for the coatings to stick together as is the case with animal glue. In certain lithographic processes, the moisture-resistant coatings were a very great advantage. Furthermore, casein is cheaper than animal glue, has less tendency to decompose, and possesses many minor advantages.

The second largest use for casein is in wood glues; and here again the water-resisting qualities have been the reason for the rapid development. Using casein as the base, glues may be compounded which are soluble in cold water but waterproof when hardened. The animal and starch glues which were formerly used possess no moisture resistance and furthermore require more care in the preparation and temperature control. Casein wood glues may be dissolved and applied in the cold with no possible ill effect to the glue or resulting bond. The casein wood glues range in property from slightly water resisting up to glues that will pass the government Army and Navy specifications for airplanes. These must give very high breaking strength even after the glued wood has been soaked for 48 hours in cold water and tested immediately thereafter.

In making kalsomine, animal-glue dextrines and the like were formerly used and are used to a greater or less extent today; but such kalsomines have no washability or water resistance. Today there are many dry, powdered casein paints which require simply mixing with cold water. They are made in various qualities all the way from slightly washable kalsomine up to very insoluble types of paint suitable for application to the exteriors of buildings. A great deal of this type of paint is made for inside factory painting where a paint is desired which is more washable than a casein kalsomine but less water-resisting than a casein outside paint. Practically all of the plastic paints which have been so popular during the last few years are prepared with casein as the binding material. In recent years several manufacturers have produced very satisfactory casein paste paints prepared in a heavy consistency, with water as the carrying vehicle.

Casein is also used in calico printing and similar textile processes; in foods and pharmaceuticals, including egg substitutes and diabetic flours; for making shoe polish; and in casein plastics. Through the Casein Company's research, the once little-used raw material from the farms is on the market today in many different grades, and finds its way into hundreds of different products.



Westvaco

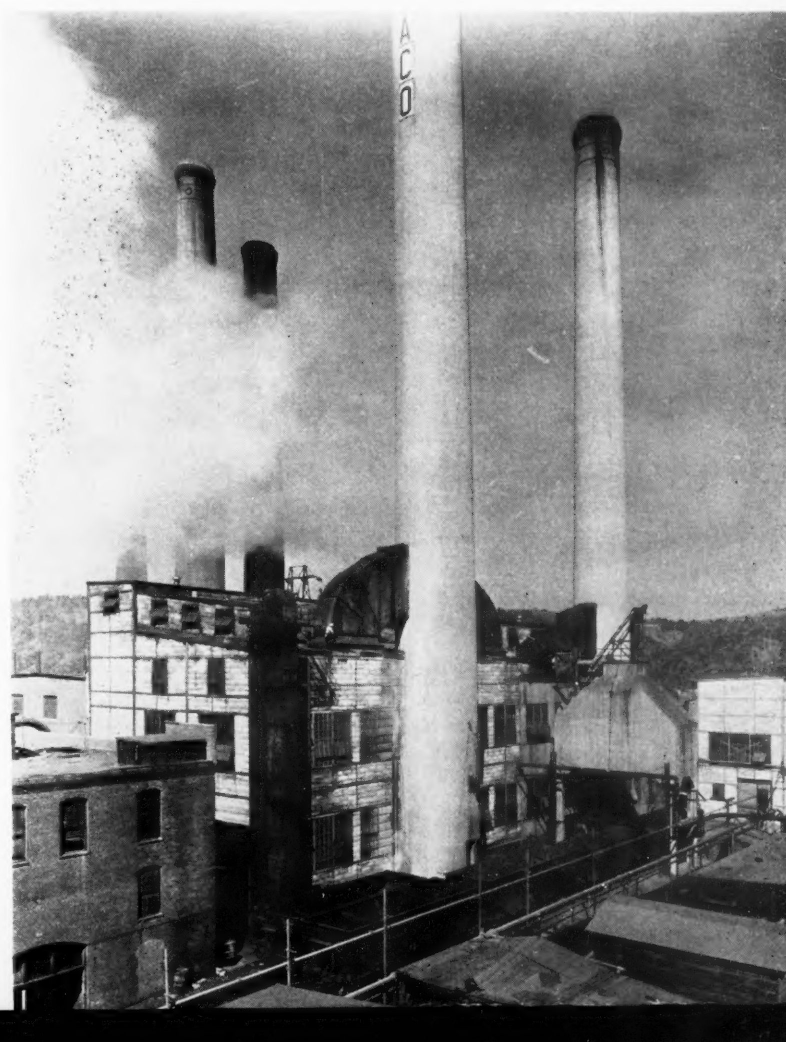
WHEN, during the World War, the United States needed phosphorus trichloride and phosphorus oxychloride for making munitions and dyes, acetic anhydride for airplane dopes and sulphur chloride for mustard gas, an American company stood ready to provide these products. It was one necessary branch of chemical industry America wasn't caught without. Because some mi itary planning board had foreseen the need and made provision? No. Because of the accident that in 1891 an active-minded fifty-year-old business man had become interested in a deposit of phosphate rock on an island off the coast of French Guiana; and because also of the fact that one of his maxims was, "Never invest money in any new enterprise unless you are willing to devote to it your own time and energy."

The Warner Chemical Company started, then, with a source of raw material, and with only the idea of a product. That first mere possibility grew into an industrial chemical, which in turn led to others; and the development of the company has been a gradual, sprouting growth as more and more products followed in logical order.

Lucien C. Warner was a physician who had gone into business and had been so successful that he had on his hands surplus funds to invest. Some of the enterprises into which he put it prospered and some did not. Among those which did badly was a wall-paper company, through which Dr. Warner became acquainted with Harris S. Hayden and learned about a deposit of phosphate rock on Grand Connetable Island. Mining rights had been assigned to the International Phosphate Company.

As far as could be determined, the deposit contained three hundred thousand tons of rock, high in phosphoric acid—which, unfortunately, was combined with aluminum, a circumstance which made commercial utilization of the phosphoric acid a very dubious possibility. This great pile of raw material fascinated Dr. Warner, however, and he took an interest in the company—none too soon. The phosphoric acid was not in a soluble form, and its value as a plant food was already being questioned by chemists.

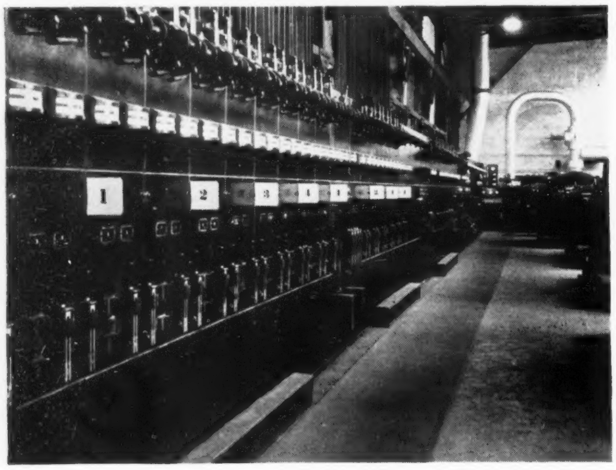
First research attempts upon the unpromising material were made in the wall-paper factory; but shortly after, a plant on the Harlem river, in the Bronx, was leased, and the research transferred there. The first effort—to combine the rock chemically with ammonia—was a failure. So was the attempt to combine it with potash. Mr. Hayden, assisted by a young chemist, next took aim at trisodium phosphate, and this



Producing the power for the South Charleston plant.

time hit the mark. The Warner Chemical Company had learned how to make its first product.

This success encouraged Dr. Warner into buying out all his associates except Mr. Hayden; and in 1897, when Mr. Hayden left to go with the Eastman Kodak Company, Dr. Warner bought his one-third interest and became sole owner.



Nerve centers of the world's largest installation of chlorine cells.

At about this time, Franklin H. Warner, son of the company founder, was graduated from college; and he brought into the organization the interest in chemistry he had acquired during his college courses. With this reinforcement, the company decided to expand. The little factory on the banks of the Harlem was abandoned in favor of a new plant, at Carteret, New Jersey, the first of the many chemical enterprises to spring up on what was at that time a desolate semi-swamp.

The company's knowledge about phosphates had increased by now; and provision was made in the new plant for putting additional chemicals on the Warner list. Trisodium phosphate and phosphoric acid were joined by di-sodium phosphate, for which the new process of silk weighting was creating a large market. At the same time the trisodium operations were expanded to take care of the demand growing out of the use of this salt in the cleansing field.

When the Carteret enterprise was well under way, the company's growing reputation for work on phosphates attracted to it a new personality, with a resultant still further expansion in the company. William D. Patten had discovered the advantages of using mono-sodium phosphate pyro in baking powder; and he had been granted a patent on the product. He came to the Warner Company to find out whether he could get from them his raw material. To compete with tartrate baking powders, he had to reduce the cost of the pyrophosphate from a dollar a pound to thirty cents a pound. He felt that he could learn, on his own financial resources, how to make the process cheaper; and he would then have to interest capital in financing the commercial operation.

After Mr. Patten had talked to Dr. Warner for some time about raw materials, however, the two men came to a commercial agreement whereby the Warner Chemical Company was to make the pyrophosphate and two new selling organizations were to market it: the Monarch Chemical Company to the bakers, the Warner Baking Powder Company to the housewives.

Reducing the cost of acid pyrophosphate turned out to be difficult. Mr. Patten sat on top of the job night and day for a year, by the end of which time he had learned how to make a product which could economically be put into the plant. This new product, moreover, led to others, particularly acid phosphate of lime, used in baking; and it led also to business connections that expanded the company.

Dr. Oscar Neuberg, a German chemist, heard of the success of the new American chemical company, and he came to America to investigate—reversing the usual process, by which American chemists went to Europe. Dr. Neuberg was much impressed by what the Warner Chemical Company had done. He entered into a contract whereby his German company became the selling agents in Germany; and through his knowledge of general European selling conditions, a British sales connection was also made.

One of the first steps in the company's growth—the Carteret plant.

Westvaco chlorine cells breaking up salt into chlorine and caustic soda.

In addition to new commercial leads, the work on phosphate salts also opened up new chemical fields, particularly when Mr. Patten learned how to make aluminum hydrate out of the waste materials left over from processing the Grand Connetable rock. Aluminum hydrate became an important item in the Warner list.

The company was entering other fields, too. Throughout, a definite policy was maintained. The method was to try out a line, extend it if it showed promise, or drop it at once if it did not. When the Warner Baking Powder Company failed to capture the housewife, the company was dissolved, and the parent company's efforts were put on expanding the successful Monarch Company.

One project to be taken up and abandoned was the manufacture of vanillin; and from this apparent failure came the development which led to the company's most important present-day products. In preparing to make vanillin, H. R. Nelson, a young chemist, had developed some electrolytic chlorine cells. When the vanillin project was junked, Nelson was allowed to go on perfecting the cells and in a few years developed one of the most practical and efficient chlorine cells on the market.

The first cells were installed in the Carteret plant. With chlorine available, the company produced phosphorus trichloride and phosphorus oxychloride. Acetyl chloride, acetic anhydride, carbon tetrachloride and sulfur chloride were soon added; and when the World War came, Warner was the sole American producer of some of these war essentials.

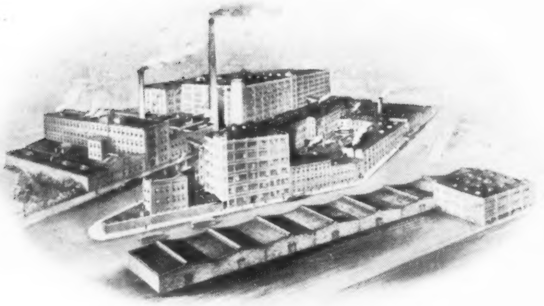
The War, of course, resulted in an enormous growth, and E. C. Klipstein was drawn into the picture by a dove-tailing of chemical needs: carbon tetrachloride for Klipstein's Carbona Company, caustic soda for his sulfur-black plant, chlorine for anthraquinone. The result was the organizing of the Warner-Klipstein Company. A new plant was built at South Charleston, West Virginia, near coal and salt.

The Warner Chemical Company also entered the equipment business, and built more than twenty electrolytic plants all over the world, some of them as far away as Norway and India. The plant built for the Chemical Warfare Service, at Edgewood, was the largest electrolytic chlorine plant up to that time. It is surpassed today only by the company's tremendous installation at South Charleston. Since Dr. L. D. Vorce became associated with the Westvaco Co. the Vorce cell has been used in the plant expansion in recent years. The Westvaco Co. markets this cell when required and also handles complete engineering of electrolytic chlorine-caustic plants.

When the war was over, the company faced a sudden drop in demand. Dr. Warner met it with his characteristic vigor. He scrapped all operations which seemed unlikely to be profitable under the new conditions; and for the second time he entered upon a program of buying out his associates. With the companies again in his own hands, and in both technical and financial order, he retired, handing over the helm to his son, Franklin H. Warner.

Three years after Dr. Warner's death in 1925, the various Warner chemical interests were consolidated into the Westvaco Chlorine Products Company. William B. Thom, secretary of Warner Chemical, became the president of the new company.

This change in management, like most of the company's changes, came from within. The growth which led finally to Westvaco consisted almost entirely of expansion, with few acquisitions of outside companies. The products are those which the company has learned to make and make well, and which have survived a rigorous policy of intra-company criticism and pruning. The company has quietly consolidated its position in the chemical industry by constant improvement of its processes and by plant enlargement when these processes have turned out new products ready to be sold to consumers.



1849—Pfizer—1935

THE house of Chas. Pfizer & Co., Inc., was founded in 1849. The United States was still mainly agricultural, and New York City had less than half a million inhabitants. Scientific and technical industries were in their pioneer stage. Chemicals were high in price, inadequate in supply, and none too dependable in quality. Many of our most important products of today were at that time entirely unknown; while others that were in general use were controlled by foreign countries favored by apparently insurmountable natural advantages.

The founders of the business, Charles Pfizer and Chas. F. Erhart, began manufacturing operations on a modest scale in a small plant in Brooklyn. Their first purpose was to produce a dependable supply of chemicals of improved quality. In addition, new products were developed to meet new conditions. As a consequence of this policy, the business has continuously expanded until today our plant in Brooklyn covers many acres.

Among the products needed by our growing manufacturing chemical industries during the early 1860's were the tartars. These are manufactured from crude materials known as "argols" which are formed in the juice of the grape and deposited in the wine casks during the natural fermentation period. It is estimated that 100 gallons of wine develops 5 to 6 pounds of argols yielding about two pounds of cream of tartar. Naturally, the wine producing countries were the first to utilize these residues, and cream of tartar was probably the first product marketed. Before the Civil War tartaric acid and cream of tartar were imported, principally from France. The Tariff Act of 1862 established an import duty which made manufacture in the United States feasible. Since our company was already long established as a producer of fine chemicals, we undertook the manufacture of the needed tartar products, with the belief that their general use in foods and medicine demanded a higher standard of quality than had yet been attained in Europe. We have continued to emphasize purity and uniformity in all our products.

More than half a century ago the growing usefulness of citric acid induced our company to undertake its manufacture from citrate of lime. This raw material was made in Italy from cull lemons and other citrous residues, and after careful purification yielded an acid of satisfactory quality, marketed in the form of the crystalline monohydrate which was then the acceptable form. The many valuable properties of citric acid made it important in the manufacture of food and medicinal products. As consumption increased, difficulties were encountered in obtaining continuous supplies of citrate of lime. Recognizing the disadvantages of a raw material controlled by a foreign monopoly, our company early sought to develop a more direct method of preparation from some raw material abundantly available in our country. Another object was to find an improved and more universally acceptable form for our product.

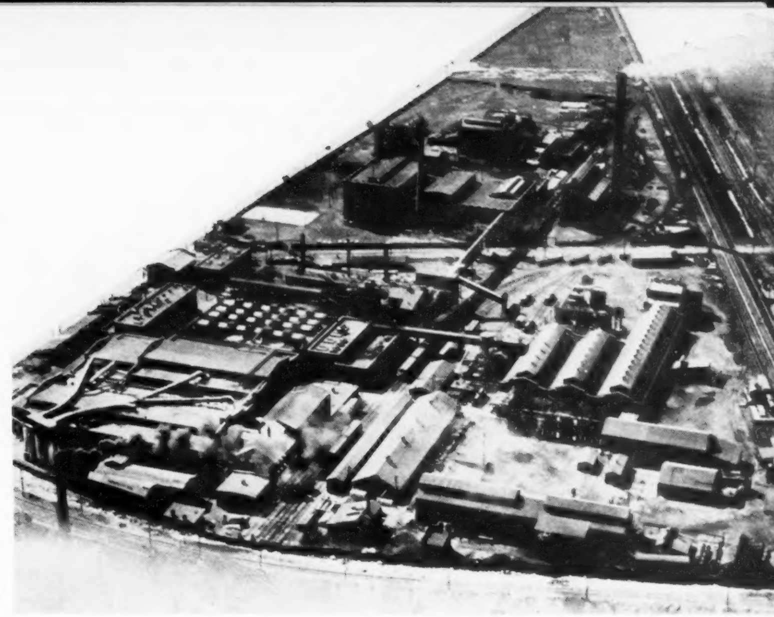
Many difficulties were encountered, but success has been achieved. Chas. Pfizer & Co., Inc., was the first company here or abroad to develop and operate a commercially successful vegetative process for producing citric acid from sugar; and also first to crystallize this acid in a new anhydrous form of greatly extended usefulness. The advent of Pfizer crystalline anhydrous citric acid marks a new epoch in citric acid history.

With many products we believe it sound commercial procedure to view increasing demand as a contributing factor to economic production. Chas. Pfizer & Co., Inc., have steadily reduced their prices as consumption increased. Citric acid and its salts are now available at very moderate cost. American consumers have profited materially through our scientific accomplishments.

Gluconic acid is a comparative newcomer among commercial chemicals. Once rare, high priced and without known uses, its favorable physiological reactions and unusual property of forming soluble salts with all metals have made it increasingly useful. The most important salt to date is calcium gluconate, which already has an established use in medicine as a means of introducing calcium into the body. Being soluble, practically tasteless, and non-irritating to the tissues, it is compatible with most foods and medicinal substances, and may be administered either orally or by injection.

In 1935, after 86 years of experience in the manufacture of fine chemicals, Chas. Pfizer & Co., Inc., stand ready with all that was best in the older chemistry and much that is better in the new to contribute what they may, scientifically and commercially, to the advancement of our industry.

Electro-chemicals



The Hooker plant at Niagara Falls.

PRIOR to the 18th century potash was the most convenient form of strong alkali. During the Napoleonic wars England cut France off from her supply; and under this emergency LeBlanc devised a process for the manufacture of caustic soda which was subsequently supplanted in 1861 by the ammonia soda process. This process is employed today for the manufacture of soda ash and caustic soda but does not produce chlorine in a form available for use in bleaching, oxidation, and chlorination.

The early part of the 20th century saw the beginning of the great electrochemical industry in this country. The development of electrical machinery and water power had placed a new tool in the hands of the chemist, and he was quick to realize its importance.

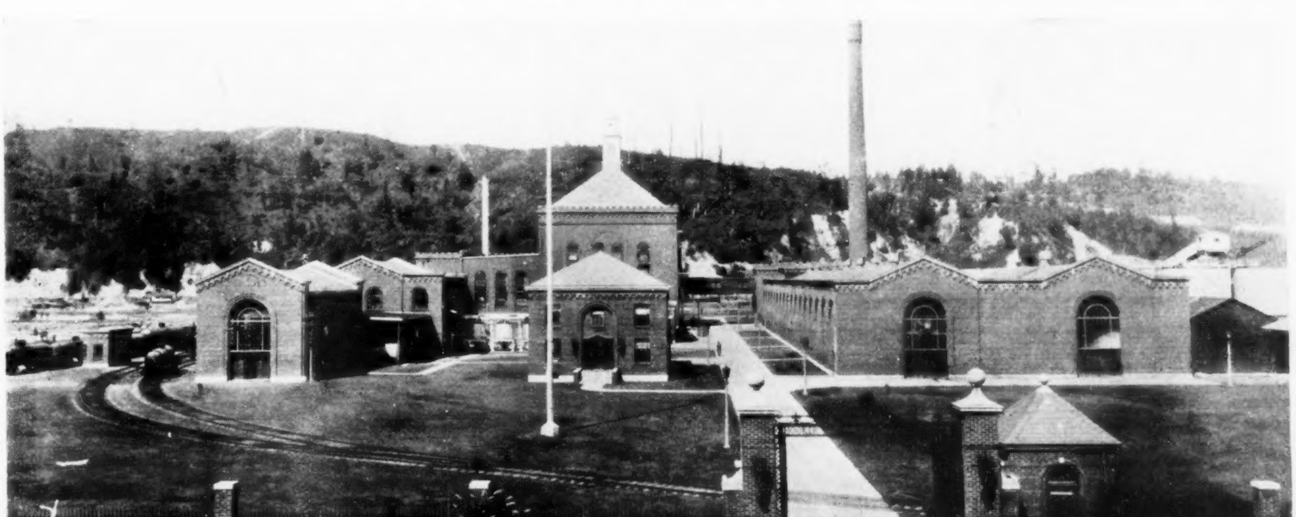
Elon Huntington Hooker, the founder and president of the Hooker Electrochemical Company, clearly visualized the bright future ahead for this new branch of the chemical industry; and in 1901, 1902, and 1903 he studied with keen interest the experimental work conducted by Clinton P. Townsend and Elmer A. Sperry for the electrolytic breaking apart of the chlorine and sodium in salt to give chlorine gas and caustic soda.

This decomposition was accomplished in a cell in which a direct current was passed from a graphite anode through a strong brine and a diaphragm to an iron cathode. The chlorine separated at the graphite anode, rose to the surface of the brine, and was led off through stoneware pipes. The sodium of the salt separated at the iron cathode, where it immediately reacted with the excess water present to form sodium hydroxide (caustic soda) in solution.

Elon Hooker saw the advantage of this new industrial force, and he secured control of the unit which came later to be known internationally as the Townsend Cell, owned and controlled solely by the Hooker Electrochemical Company.

When experiments and semi-commercial tests with the cell had confirmed Mr. Hooker's theories, he and his associates decided to build their first plant at

The new plant which serves the Northwest from Tacoma.



ELON H. HOOKER
PRESIDENT DIRECTOR

DEAN SAGE
GENERAL COUNSEL

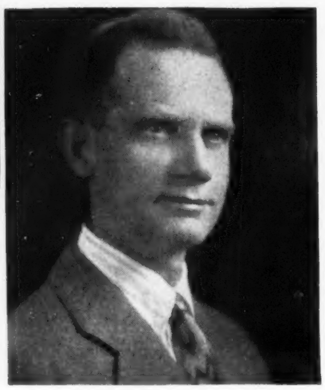
L. A. WARD
SECRETARY

ALBERT H. HOOKER
TECHNICAL DIRECTOR

"THE CHYMISTS ARE A STRANGE CLASS OF MORTALS IMPELLED BY AN ALMOST INSANE IMPULSE TO SEEK THEIR PLEASURE AMONG SMOKE AND VAPOUR, SOOT AND FLAME POISONS AND POVERTY, YET AMONG ALL THESE EVILS I SEEM TO LIVE SO SWEETLY THAT MAY I DIE IF I WOULD CHANGE PLACES WITH THE PERSIAN KING."

H. M. HOOKER
VICE PRESIDENT
IN CHARGE OF SALES
DIRECTOR

E. R. BARTLETT
VICE PRESIDENT
AND WORKS MANAGER
DIRECTOR



E. LEWIS BURNHAM
DIRECTOR

R. C. SHUMWAY
DIRECTOR

WILLARD HOOKER
VICE PRESIDENT
TREASURER
DIRECTOR

Niagara Falls, New York. This location was chosen because of its great power development, its proximity to a practically inexhaustible supply of pure salt in Western New York, and its nearness to the Eastern markets.

On January 9, 1906, the plant was put into operation. Since then until today, except for the period of general business contraction following the abnormal expansion caused by the World War, the company has consistently and steadily grown. It is now one of the largest producers of electrolytic caustic soda, chlorine, and chlorine products in the world. It is one of the large important entirely independent units in the chemical business—a basic, indispensable part of modern industry.

The main plant, the research laboratories, and the development and engineering headquarters are at Niagara Falls, New York, with the general administration and sales offices located in the Lincoln Building, 60 East 42nd Street, New York City, the headquarters for seven of the nation's largest chemical manufacturers.

As a result of the Pacific Northwest becoming in recent years an important center for the pulp industry, Hooker Plant No. 2 was built and production started in early 1929 at Tacoma, Washington, on the deep water of Puget Sound, where large ocean freighters deliver raw materials and take away finished products.

Among the treasures which man has inherited from the earth are the innumerable little cubes made of sodium and chlorine which form the crystals of common salt. It remained for the chemist to take this everyday practical substance, which had been put to many uses throughout the centuries in its natural form, and by his magic separate the molecule into its component parts. With these parts he has laid the foundations of many of the world's largest industries.

Most people will be surprised to learn that 1935 marks the tercentenary of the chemical industry in this country. To the ordinary individual, the chemical salesman is a dispenser of bug powder or rare gases for munitions. The war did serve to make the general public chemicals-conscious; but few realize the importance or the far-reaching ramifications of this great industry. The United States chemical production measured in either dollars or tons is three times that of Germany, four times that of Great Britain, and probably one-half the entire world output.

Some of the products that play an extremely important part in our daily life, so important that the very health and life of an entire community may depend upon them, have never been seen by the average person and are scarcely known to him even by name. Such, for example, is liquid chlorine. The use of this product in the treatment of drinking water has practically eliminated typhoid fever from our cities and communities. But the use of liquid chlorine in water purification, important as it is to our health, takes but a small tonnage of the total production.

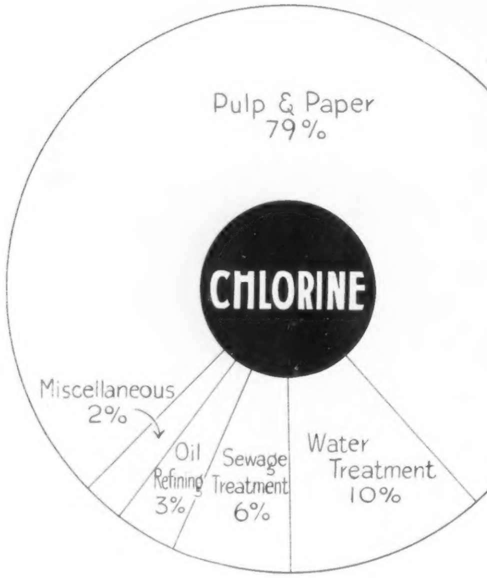
Some is used directly at the producing plants as a gas for the manufacture of chemicals, more is absorbed by

A battery of Townsend cells.

hydrated lime to form bleaching powder or chloride of lime for transportation, or is liquefied by compression and refrigeration and shipped in liquid form in steel cylinders and tank cars for final use in the bleaching of wood pulp, paper, textiles, and shellac, as either calcium or sodium hypochlorite. In this latter form it is largely used in laundries and as a household disinfectant. Other important uses for chlorine are the production of synthetic coal-tar dyes, chemicals, and pharmaceuticals, such as sulfur black, artificial indigo, anthraquinone, benzoic acid, benzaldehyde, benzoate of soda, chloroform, carbon tetrachloride, and sulfur chloride; in the cracking of oils to produce gasoline; in the purification of oils to remove sulfur; in the production of zinc chloride, for preserving timber and railroad ties; in the extraction of picric acid and dinitrophenol, alike useful as dyes and as explosives; for the production of an extremely pure muriatic acid; for insecticides like paradichlorobenzene (Paracide), used for the peach borer and the household moth, and calcium arsenate, used for the cotton boll weevil. Thus chlorine enters our daily lives quite unexpectedly through a hundred doors.

Since the Hooker Electrochemical Company is one of the world's largest producers of liquid chlorine, it maintains an elaborate research laboratory at its main plant at Niagara Falls, New York, where problems relating to the use of chlorine by the various consuming industries are constantly studied.

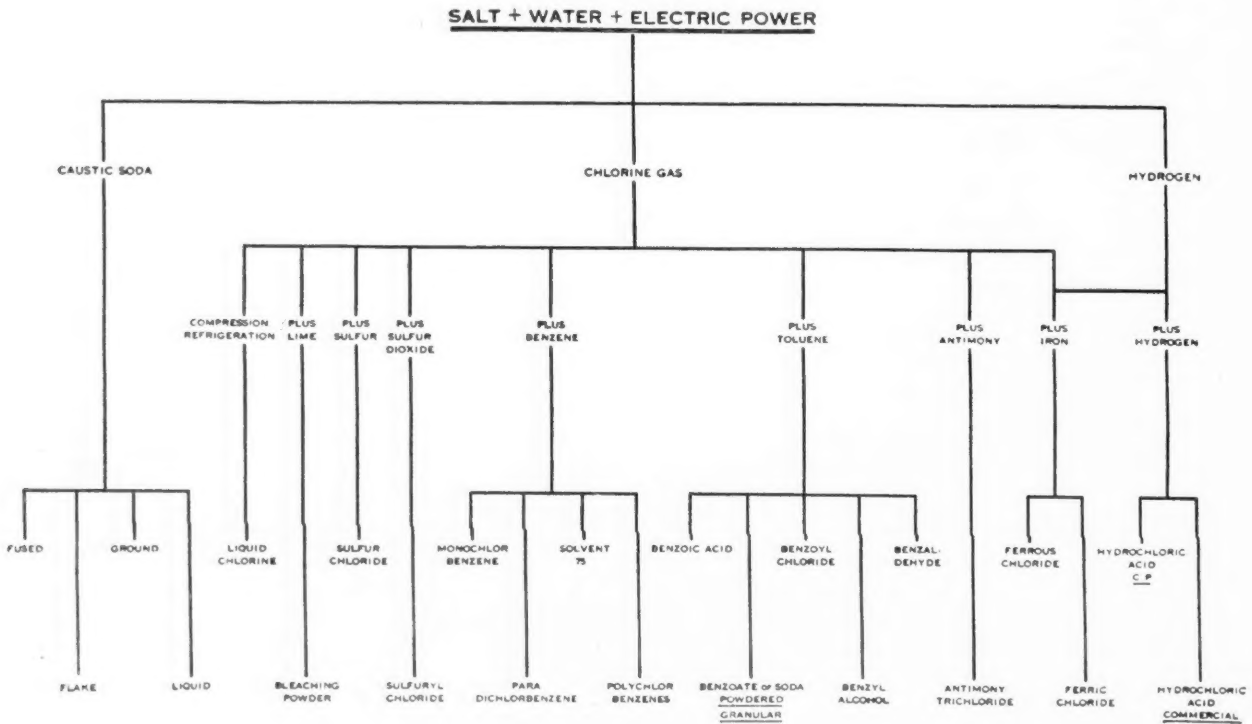
Caustic soda, the other major product of the electrolytic cell, also finds its way into many of our fundamental and essential industries, such as soap making, rayon, mercerized yarns and fabrics, refining of petroleum, rubber reclaiming, paper manufacture, explosives, dyes, pigments, wool degreasing, in organic fusions, and for cleaning metals. It is extensively



Data from Chemical and Metallurgical Engineering.

used in the production of other commercial chemicals and of pharmaceuticals, boiler compounds, water softeners, detergents, etc. It is in fact one of the most widely used heavy chemicals. These diversified consuming channels make the specific needs of individual consumers differ widely. The Hooker Electrochemical Company recognizes this condition and therefore maintains a trained staff of technical men who study problems in the field as they arise and who cooperate with the research and development chemists to promote the best possible use of the company's products and to deliver a grade of material which meets each customer's particular demands.

The growth, stability, strength, and great value of this company to its customers rest primarily on its close adherence to an ideal laid down in the very beginning of the company's history by its founder Elon H. Hooker. This ideal—the guiding spirit through the thirty years of the company's history—has been to maintain a very high standard of performance and service. An important reason for the persistence and the substantial realization of this aim for efficient service lies no doubt in the fact that the founder, several of the executives and directors, members of the technical staff, and many of the stockholders have long been and still are with the company.



137 Years of Progress

The American Dyewood Company

1798-1935

THIS company's predecessors established the logwood business in the United States over a century ago, laying a firm foundation of service and quality that has endured. Starting in Greenwich Village in 1798 as William Partridge and Sons, where the power was furnished by a horse walking around a capstan, the firm gradually developed until the establishment was incorporated May 24, 1872, in New York City as the New York Dyewood Extract and Chemical Company. In 1891, this company joined with the Boston Dyewood and Chemical Company, to form the New York and Boston Dyewood Company.

In 1835, there had been organized at Chester, Pennsylvania, the firm of John M. Sharpless and Company, which in 1895 became the Sharpless Dyewood Extract Company. This latter firm was consolidated with the New York and Boston Dyewood Company in 1904 to form the present American Dyewood Company, the main office of which is located at 100 East 42nd Street, New York City.

By merger with the New York Color and Chemical Company in 1924, the company acquired the very valuable and progressive coal-tar dye plant located at Belleville, New Jersey, where a variety of synthetic dyestuffs and their derivatives are produced with a steadily mounting and interesting growth. Many new products have been recently produced and marketed, of special interest to makers of dry colors and printing ink and to manufacturers engaged in textile dyeing and printing, leather dyeing and finishing, and the dyeing and tinting of paper.

The company is one which has firm faith in research. A fully equipped laboratory, with a definite program, is maintained at our plant in Chester, Pennsylvania. This factory is the largest in America for the production of dyewood extracts.

American Dyewood is very proud of its association with the chemical groups and with the individual members of the various chemical societies. At the time we are celebrating the 300th anniversary of the beginning of the chemical industry in the United States, it may be of interest to note that logwood was discovered in Central America and sent over to Europe over 100 years before John Winthrop, Jr., mixed up sulphur and saltpetre. Logwood was probably the first black dye available in America. Its use in Virginia is mentioned as far back as 1650; and the synthetic blacks were not patented until 1890 to 1896.

During the last few years dyewood extracts, and particularly new processes for their application in the textile industry, have shown great progress. There has been a marked saving in time and labor insofar as the use of these valuable products is concerned. The unmatched beauty of a bloomy, intense black, which is imparted by logwood extract and its derivatives to all classes of woolens, silks, and artificial fibres, is now, and always has been, the standard for the textile industry. Modern methods worked out by this company's laboratories have kept the use of these extracts in the forefront of the minds of the dyers of quality products.

New fields for the use of logwood extract have recently been developed, making the extract or its derivatives a novel and important item in the printing ink industry. Black lacquer bases of various types are also produced from logwood, and the consumption of logwood in the lacquer industry has shown a steady growth for the important reasons of strength of film, covering power, and permanence. A new logwood extract—"Adcelane"—is making its presence steadily felt in the dyeing of the two main classes of artificial fibres, rayon and cellulose acetate, principally on account of its low cost and brilliance of shade.

The demand for natural dyewoods has been steady all through the depression; and now that the country is entering a period of renewed industrial activity, the company looks forward with great confidence to the future.

Dyes in the raw, piled up on the banks of a tropical river.

No. 126 Chambers Street. Store and two basements, and two basements adjoining. 1872-1895.

The Development of Certified Pure Food Colors

by H. Kohnstamm & Co., Inc.

THE history of any business institution is of interest and importance to others only to the extent to which it has contributed toward the welfare of the people and the development of the industry it serves. Perhaps because of the important part pure food plays in its influence on the good health of our people, we are justified in giving in this historical record a brief outline of the events that led up to the development and certification of harmless food colors.

The name of Kohnstamm has long been identified with color chemistry. Members of the family were among the first producers of ultramarine in Europe. Later, when the firm of Kohnstamm was established in New York at No. 3 Tryon Row, in 1851, ultramarine was its leading specialty. The high quality of this specialty won for it the First Award for Blue at the World's Industrial Exhibit in the year 1853.

Prior to the year 1880 it had been the custom of small confectioners to use dry paint or technical colors in tinting their products. The result was that they came in for a lot of unfavorable publicity, because of illness attributed to the eating of colored candy.

Along about 1880 there was considerable agitation among the better concerns for a higher grade of candy and against the use of harmful colors and adulterants. At about the same time we conceived the idea of producing harmless food colors and retained as our adviser the eminent Dr. H. Endemann, pupil of Hoffman, the great early coal-tar chemist of Germany. Dr. Endemann was our guide in the selection of suitable colors, made after extensive physiological tests.

So successful were we in developing harmless food colors that, when the National Confectioners' Association held its first convention in the year 1884, our colors were not only accepted but endorsed by the members. After the standards established by Dr. Endemann had been attained, every batch of color afterwards manufactured by us was made to conform to his high standards of purity or was rejected.

This was the beginning of harmless food colors in America and led later to the certification of such colors through the Bureau of Chemistry, Department of Agriculture, in the year 1907.

No. 3 Tryon Row (now site of Municipal Building). Store and one basement. 1853-1869.

The purification and development of certified food colors was a most difficult task. It was only through the faith and perseverance of E. G. Kohnstamm that the work was pushed through and certified harmless colors replaced technical colors in food products.

Naturally, we are proud of having pioneered this important contribution toward the development of the confection industry. It did much to remove fear and prejudice from the public mind regarding the use of color in candy and food products.

Our early activities in selling ultramarine brought us into contact with laundries. The business of "Laundry Supplies" under that heading was first advertised by us in the trade journals, its initial appearance being an eighth page in *The National Laundry Journal*, February 15th, 1879. It was at an earlier date, however, in the year 1867, that the firm decided the time had come for a salesman to make regular calls on the trade, selling laundry supplies. To E. V. Kohnstamm undoubtedly belongs the distinction of having been the first laundry supply salesman.

The laundry industry has made great strides forward since those early days as we contrast the great marble and tile structures that house the large modern laundries with the crude, barn-like shelters in which was born a new industry. Since that time the development of the laundry-supply division of this company has been allied with the growth of the laundry industry.

Members of the firm were among the first to realize that there could be no continued and sustained progress without constant research. Old products must be constantly refined and improved . . . new methods and materials must be developed to make possible the advancement of an industry.

Completely equipped laboratories were therefore established, both for the purpose of checking manufacturing processes to insure conformity with the high standards of quality that had been established, and for the extensive research work done on new products.

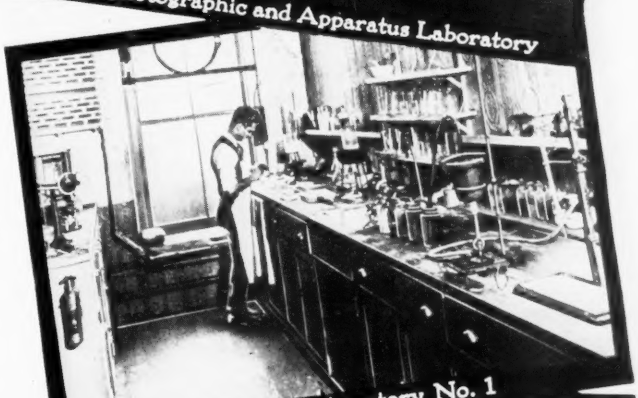
Prior to and since the invention of harmless food colors by our research chemists, many other products of an allied nature have been developed and included in the line: technical colors, cosmetic colors, natural and synthetic food flavors, extracts, etc. Also heavy industrial chemicals such as detergents, cleansers, soaps, stain removers, starches, and blues, running into many hundreds of items.

The firm was incorporated in 1922, and the main office is now located at 87 Park Place, New York City. Officers are E. G. Kohnstamm, president; Joseph Kohnstamm, treasurer; Lothair Kohnstamm, vice president; William Longfelder, vice president; and Max Wallenstein, secretary.

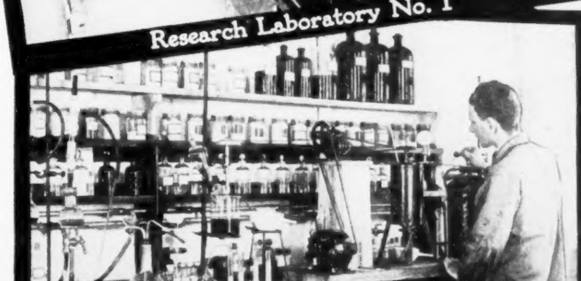
Today, modern factories are owned and operated at Camden, New Jersey, Brooklyn, New York, and Clearing, Illinois. Distribution of the manufactured products is made through 18 company branches located in the leading trading centers of the country. This set-up is ideal in that it represents an unbroken chain leading from the development of an idea in the laboratory, through production in the factory, and ending in distribution direct to the user by way of our own branch houses. It offers a single-service responsibility from the manufacturer to the user which is, in itself, a guarantee of uniformly high quality and maintenance of set standards in the goods sold.

Bleach Research and Control Laboratory

Microphotographic and Apparatus Laboratory



Research Laboratory No. 1



Soap Research Laboratory

Solvents and Plasticizers for the Lacquer and Chemical Industries

To follow the flow made by these products through the lacquer, chemical and allied industries unfolds a fascinating story and an illuminating view of our country's chemical development. Their uses take these products into widely divergent fields. Consumed in large quantities on the Detroit automobile lines, they also make possible milady's nail polish. Most of these products were unknown in commercial quantities two decades ago.

The formation of the Kessler Chemical Company was a growth from the World War. At that time there was a shortage of camphor. Triacetine can be used as a camphor substitute, and this was the first product manufactured by the Kessler Chemical Company, when it was founded in 1921 at Orange, New Jersey, by Dr. J. M. Kessler, who still remains its president.

Acetine was next logically manufactured, this product finding use as a solvent for dyes in textile printing.

Immediately followed a large demand for diethyl phthalate which was then selling at four to five times its present market price. This was required as an alcohol denaturant and was the next product manufactured. Diethyl phthalate was a logical stepping stone to the production of other phthalates, particularly dibutyl phthalate, which has always been in demand as a nitrocellulose plasticizer.

The lacquer industry was just starting its phenomenal growth at this time. The use of lacquer finishes made possible by low viscosity nitrocellulose and an economical and adequate supply of solvents, for automobile, furniture and general industrial finishes, gave rise to a huge industry created almost overnight.

The demand for solvents and plasticizers was urgent, and the few producers in the early twenties had difficulty in meeting the demand. At one time the Kessler Chemical Company had contracted for a major portion of all the crude fusel oil that it could find in the world markets to produce amyl acetate.

In the early twenties the Kessler Chemical Company entered ethyl acetate and butyl acetate production. It has always supplied a substantial quantity of these products, which still remain the two solvents most widely used in nitrocellulose finishes.

In 1926 secondary butyl and amyl acetates were made in regular commercial quantities. These products today have a definite place in the solvent industry.

During 1926 brushing lacquers were introduced, and these required a high boiling solvent that had a slow rate of evaporation permitting the brush marks to disappear before the lacquer set. To meet this demand butyl propionate was produced. Brushing lacquer, however, was not a success and soon was displaced by quick drying varnishes and enamels.

Refined fusel oil has always been produced in all grades. A very refined product has been developed as a chemical reagent. Another grade is used in the manufacture of amyl derivatives and pharmaceutical preparations. These products are usually referred to as isoamyl alcohol. Commercial grades of refined fusel oil are used in nitrocellulose products.

Dibutyl phthalate was the first plasticizer used for nitrocellulose and still remains the most extensively used plasticizer for lacquers. Diamyl phthalate is used for the same purpose and both products have found wide usage because of their plasticizing effect in many other products.

The lacquer industry depends vitally on solvents and plasticizers, and its future will depend on the availability of these materials at low prices. Although in keen competition with the synthetic resin finishes, lacquers have definite advantages and will undoubtedly remain a major industrial finish.

Although lacquers remain the major consuming industry for solvents and plasticizers, many other uses are developing continually, and the markets are almost limitless. Butyl stearate was introduced as a water repellent plasticizer for nitrocellulose finishes. It finds use also in the cosmetic industry replacing glycerine and vegetable oils.

Cellulose acetate plasticizers manufactured include dimethyl and diethyl phthalate, triacetine and dibutyl tartrate. Triacetine is both a nitrocellulose and cellulose acetate solvent and plasticizer. Although its largest use is as a cellulose acetate plasticizer, it is also used as a fixative. Because of its non-toxic properties, it finds use in pharmaceutical preparations. For this purpose the Kessler Chemical Company has developed a pure triacetine, the first time that this has ever been available commercially at a reasonable price.

The Kessler Chemical Company for several years was the only manufacturer of these acetines, and is still regarded as the principal producer.

In 1929 the Kessler Chemical Company was purchased by the American Commercial Alcohol Corporation, and its name was changed to The Kessler Chemical Corporation. The plant was moved to Philadelphia to be combined with that of the parent company, where more economical and efficient production could be achieved. The alcohol produced by the American Commercial Alcohol Corporation complements the Kessco line of solvents and plasticizers, so that purchasers of mixed carload drums and compartment tank cars can secure their entire requirements from one source, effecting the savings that this combined purchasing permits.

Potash Independence

POTASH was one of the chemicals in which John Winthrop, Jr., was interested three hundred years ago, and his talents were directed toward developing new processes for producing this commodity, without which even the earliest settlers would have found living harder than the wilderness conditions in America dictated it should be. Potash was known before the Virginia and New England settlements were begun, and one of the first community enterprises to be established as each new colony was founded was a plant for leaching wood ashes obtained from burned timber. They boiled down the lye in large, open kettles and the residue was a white solid which was called potash because it was made in pots from ashes. Potash was then used in making soap so much needed by the colonists.

Winthrop and others improved on the simple potash processes, and in time enough of the chemical was produced to supply the requirements of the American colonies and in addition considerable quantities became available for export to the old world. Incidentally, another interesting historical fact in potash history is that the first invention to be approved after the establishment of the United States under our constitution was a process for making potash and pearlash. The patent, which was not numbered, was signed by President George Washington on April 10, 1790, and was issued to Samuel Hopkins on July 31st of that year.

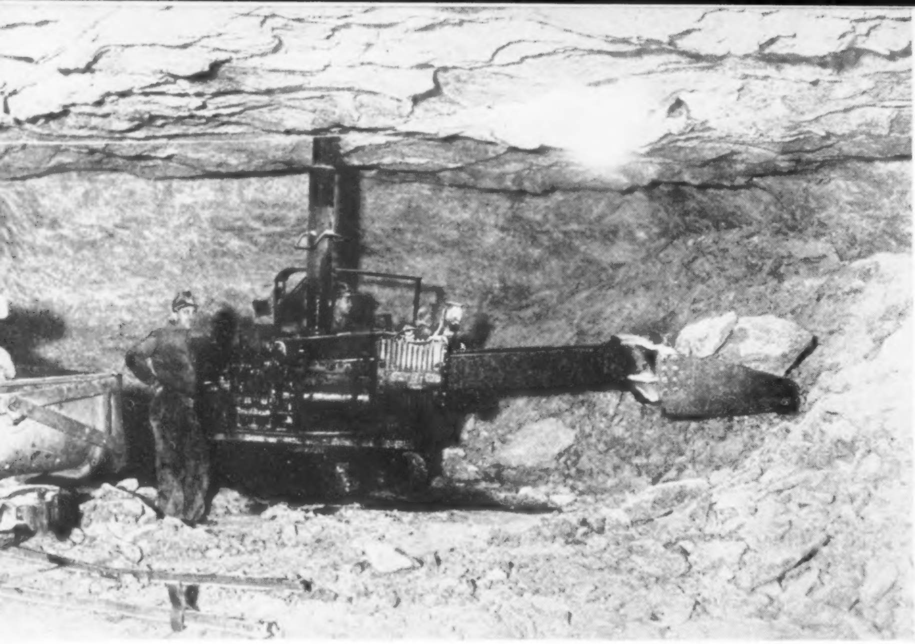
In the early days, the New England States had the principal potash plants because of the relatively higher potash content of their trees as compared with the timber farther south. The bulk of the exports were from these northern forested regions. Today, in certain towns in Vermont and New Hampshire, remains of old potash works can be found. One of the largest works was located on a "Potash hill" overlooking the Connecticut River, not far east of Bellows Falls, Vermont.

H. I. Smith, Chief of the Mining Division of the United States Geological Survey, tells us in his review of potash history* that between the Revolutionary War and the Civil War, annual potash production in the United States ranged in value from $500,000 to $2,000,000 and the price from about $100 to $200 per ton. In the report of the 1850 census, potash is rated as America's most active chemical industry. There were 569 plants in operation. France was then the best potash customer!

The discovery of potash salts in Germany, first in 1837 in the brine of a well, and in 1857 in a shaft, and the determination through the researches of Dr.

* Three and a Quarter Centuries of the Potash Industry in America, *Engineering & Mining Journal*, Volume 134, No. 12, December, 1933.

The United States Potash Company's refinery at Carlsbad, New Mexico.



Scooping up pink rock in a dustless, air-conditioned mine to make America independent of foreign potash.

Liebig that these salts were valuable plant food, changed the whole course of the industry. Potash from wood ashes of American forests became unimportant in the world trade, and Germany became the chief source of this chemical now destined to be essential in agriculture as well as industry.

There was no Government conservation policy in the several German States and neither was such a policy adopted after the formation of the Empire. Too many mines were opened and overproduction on a grand scale was threatened, but German industrial management in time organized to control production and price with the result that in so far as exports were concerned a virtual monopoly on potash was established.

Long before the turn of the century nearly all potash used in the United States was imported from Germany. As early as 1904, 117,196 tons K_2O of various grades of potash were imported. By 1910 importers had more than doubled this figure. It was then that farseeing scientists in Washington began to urge exploration to find if possible, a domestic supply of potash. In 1911, Congress authorized field work to search for natural deposits of potash but it was not until after the World War that they were found.

The war, of course, cut off imports from Germany and tremendously expensive expedients had to be resorted to in the United States to secure absolutely essential minimum quantities for war supplies. Of the 128 plants erected during the conflict only a very few survived, chief among them the American Potash & Chemical Company, which still makes potash from the brines of Searles Lake, California. It is estimated that $50,000,000 was spent in making wartime potash, the total annual output of which reached only 54,000 tons K_2O. Prices rose to $600 per ton. German potash returned to the American market in 1919, and the French product from the mines of Alsace recovered by the Versailles Treaty from Germany also entered this market, but the producers in the two countries organized a cartel which prevented a price war.

Vividly remembering America's predicament when the potash supply was cut off during the war period, our Government through the Bureau of Mines and the Geological Survey resumed explorations seeking a domestic source which would make certain that there would be no recurrence of the "potash famine" we had just experienced. The sum of $500,000 was appropriated over a period of five years for this exploration work.

In 1926, the Snowden & McSweeney Company, an oil operator, discovered indications of sylvinite, a potash ore, while engaged in sinking an oil well in New Mexico east of Carlsbad. This led to organization of the United States Potash Company, Inc., which continued prospecting and finally discovered commercial deposits of ore about twice as rich in K_2O as the German deposits. Subsequently several Government core tests developed potash beds and further exploration was continued for several years by the Government and private interests holding exploration permits from the State and Nation—the owners of the land. Up to January, 1934, drill cores taken by all prospectors in exploration of the New Mexico potash field would have measured, if placed end to end, 95,000 feet or 18 miles.

The United States Potash Company, Inc., is today the largest potash mining concern in the United States.† It has two shafts, each almost exactly 1000 feet deep, on its leased holdings in New Mexico. These shafts are equipped at the present time to bring from the mine 2000 tons of ore per day, but with some additional machinery could raise 6000 tons per day. As the ore averages over 26 per cent. K_2O this means a possible pure potash production of over 460,000 tons K_2O a year. It is probable that not much more than 300,000 tons K_2O are now consumed annually in the American market. Obviously, this mine can easily supply all present requirements of the domestic market.

Another property has been developed by the Potash Company of America, a few miles north of the big

† For an interesting account of a personal inspection of the Carlsbad mines see Williams Haynes' article Pink Potash and Carbon Black, CHEMICAL INDUSTRIES, July, 1934.

pioneer mine. Its capacity will be large. And in California the American Potash & Chemical Company extracts over 150,000 tons of muriate per year from Searles Lake brines.

Technically the ore in the United States Potash Company mine is sylvinite, a mixture of common salt ($NaCl$) and sylvite (KCl). The ore deposit is 10 to 12 feet thick, and generally speaking, pink crystals are the predominant feature of the ore body. Rock salt forms the roof and floor of the entries and rooms. Mining operations are similar to those in coal mines. The salt is undercut by machines and after shooting is loaded on cars with scraper and shovel loaders and hauled to the bottom of the shaft by electric locomotives. All equipment is electrically driven. The mine is splendidly ventilated, the air is fresh and clean, there is no dust, the temperature is 68° F., and the pink color of the crystals completes a really beautiful setting for a mining operation. One rarely thinks of a mine being beautiful but the word is properly used in describing this potash mine. It is a beautiful thing.

After grinding in a mill at the surface, the potash ore is transported by tramroad 16 miles to the Company's refinery located not far from the Pecos River. Some of the salts as taken from the mine and ground, go to the fertilizer manufacturers as manure salts. The bulk of the tonnage, however, is converted by refinery processes into muriate of potash, potassium chloride 99½ per cent. pure. The K_2O content is 62-63 per cent. It is called high grade muriate. In another part of the refinery plant, there is mixing equipment which produces 30 per cent. and 50 per cent. grades of salts and muriate respectively. The refinery can produce about 140,000 tons of muriate annually. Steam for refinery processes is furnished by gas fueled boilers and power generated by steam turbines with auxiliary Diesel equipment available at the mine as standby equipment.

It is quite a surprise to travelers along the highways south of Carlsbad to suddenly observe to the eastward a huge industrial plant, standing alone in an arid region. The great seven story refinery is especially striking at night when it can be seen across the desert from a distance of many miles.

This entire potash development took place during the depression for although the discovery of potash was found in the core-drilling test in 1926, it was 1931 before construction of the first shaft was completed and the commercial deposit discovered. In these trying times, the Company has been able to provide employment for upwards of 500 men. The Company's very able organization was largely recruited in New Mexico. Its employees live in Carlsbad, a thriving city of 4,000 people, probably best known as the gateway city to the famous Carlsbad Caverns National Park.

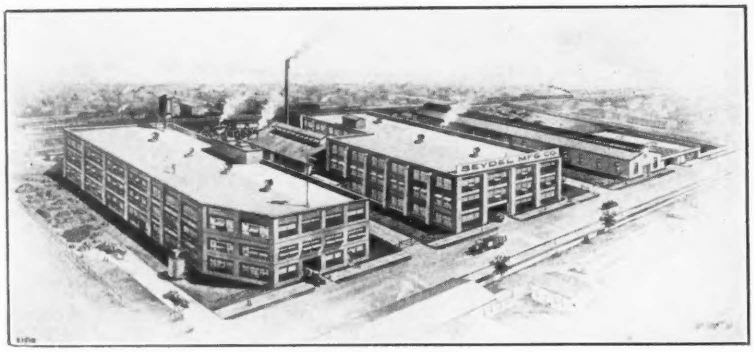
The New Mexico potash of all grades has been well received by consumers in all parts of the country. With the cooperation of the Santa Fé Railway System excellent service to customers has been furnished at all times.

The products are sold under the trade name of "Sunshine State Potash," and the trade-mark is an adaptation of the ancient Zia Indian Sun Symbol. New Mexico is the "Sunshine State," and its Zia Sun Symbol in one form is an emblem of the State, which it uses on its flag, highway number markers, etc.

New Mexico is very proud of its potash industry and the United States Potash Company is proud that its properties are in this interesting State.

As for the country as a whole, America has regained her ancient position as an important potash producer and her independence of foreign sources of an essential chemical.

U. S. Potash mine-surface buildings, set in the middle of the deserts of New Mexico.



Seydel Chemicals

in Three Fields

AN already well-established chemical firm which showed its adaptability by entering new fields during the war, the Seydel Chemical Company now has three distinct classes of products: textile chemicals, fine chemicals used in the food and drugs industries, and medicinals.

When Herman Seydel founded the company, in 1904, the chief products were textile chemicals, manufactured first in Atlanta, later in Jersey City, where the plant was moved in 1909 to serve both northern and southern mills. In addition to making the usual chemicals used by textile mills, the company researched and developed formulas for specialties which served multiple purposes. For boiling out cotton before bleaching, Desol was perfected, which has the triple action of buffer, detergent, and solvent. Another development was Sizol, used in treating cotton and other yarns before weaving, and which has made modern high-speed looms possible.

In addition to these leading products, the company makes a number of finishings and supplies textile chemical specialties for many purposes.

The service to food producers lay largely in the manufacture of benzoates, particularly sodium benzoate. The company engaged in educational work to show the public that sodium benzoate is harmless. It was discovered that many foods contain sodium benzoate put there by nature. Cranberries, for example, contain twice as much as the tenth of one per cent. ordinarily used as a preservative. It is the opinion of the Seydel organization that Wiley's old tirade against benzoates was fundamentally unsound and hurtful to the American public. His adverse ideas were thoroughly demolished by the facts recorded in the Remsen report and published by the government as Report No. 88, Department of Agriculture, 1909.

The Seydel pharmaceuticals department was begun almost at the start of the war. Herman Seydel, convinced that the American chemical industry would lead the world for generations after the war was over, threw the organization into the research on organic chemicals; and he enjoys pointing out that *Chemical Abstracts* still gives bi-monthly evidence of the leadership taken by American chemists in both pure and applied chemistry.

A result more immediately interesting to the company was the fact that this research made Seydel the headquarters for benzoates, succinates, and various anesthetics. It is the largest producer of benzoates in America today.

Herman Seydel also assisted in forming the Synthetic Organic Manufacturers' Association, of which he was for a time vice-president. He was active in securing the protection which the Wilson administration gave organic chemical makers; and he feels strongly that for the welfare of the nation Congress ought not to relax in doing everything it can to insure a healthy, vigorous chemical industry.

In the medical department the company is carrying on intensive research, feeling that many medicinals, particularly German-made medicinals, have been sold and taken without sufficient regard for the fact that many of them have harmful after-effects. The two outstanding examples are aspirin and amidopyrine. The latter is now known to cause a decrease of the white blood corpuscles, while aspirin is believed to be as insidious as other phenolic chemicals.

Throughout its research Seydel has had the cooperation of private hospitals, city institutions, and many individual doctors. One very recent product is Subenon, an anti-arthritic and anti-rheumatic just now coming out of the clinical research stage. It brings about motility of the parts treated, and freedom from pain. Outstanding advantages are the complete lack of toxicity, and favorable reception by the patient. In giving, at last, a method for the treatment of rheumatoid arthritis, Subenon marks a definite advance in the handling of diseases related to the blood stream. Another new product is a derivative of para amino benzoic acid which will be marketed under the name of Paramon, an analgesic which shows no toxicity when administered in quantities 600 times greater than necessary to relieve an ordinary pain. Other products of the medical department are used in special fields: Benacol solution in the treatment of pruritus ani and to block nerves for the prevention of post-operative pain; Aminocaine as an improved local anesthetic; Mobenate as an anti-spasmodic. The company makes a varied line of other well-known medicinals.

Still further research on medicinals—and on all the other chosen lines of chemical endeavor—is going forward today as the company moves into the ever greater field of service that lies ahead of chemical industry.

The Merck Pharmacy "At the Sign of the Angel," 17th Century.

A Manufacturer of Fine Chemicals

• ***Onto a faintly sketched historical background of the development of pharmacy in the United States are traced the origin and growth of the House of Merck.***

THREE hundred years ago! The Old World had awakened from the provincialism, ignorance, and misery of the Dark Ages. A New World had been discovered, and in men's minds new ideas—social, political, literary, and scientific—were awakening. The movement of men, with their hopes and ideals, to the new lands of Freedom across the Atlantic had begun. The sciences born of Alchemy, yet in their infancy, were rapidly developing.

It had been ordained by the English Parliament in 1542 that "at all times from henceforth it shall be lawful for any person, being the King's subject, to practice the art of healing according to their cunning; as the Company and Fellowship of Surgeons of London, minding only their own lucres, and nothing the profit or ease of the patient, have sued, troubled and vexed honest persons, whom God hath endued with the knowledge of the nature, kind and operation of certain herbs, roots and waters." The results of this ordinance are seen in Shakespeare's masterly description of the Mantuan apothecary's shop in the opening scene of the Fifth Act of Romeo and Juliet.

From Southwark, where Shakespeare's own theater was situated, came a scholar of Emmanuel College, John Harvard, with his four hundred books which became the nucleus of the library of the college established by the Pilgrims in 1636 at Newtowne, later to become Harvard University.

Another of the men who came to America at this time was John Winthrop, Jr., the eldest son of Governor John Winthrop. As early as 1633 he imported laboratory apparatus and chemicals from England and became the first promoter of chemical industries in the Colonies. In his large library there were many books devoted to chemistry and medicine and also a number of alchemical books which had formerly belonged to Doctor John Dee.

Winthrop early realized the fundamental importance of the saltpeter industry. Through his influence the General Court of Massachusetts, in 1642, passed an order that every plantation in the colony should erect a house to make saltpeter. In 1650 he organized a chemical stock company, the first of its kind in America, to manufacture saltpeter. Around Boston, New York, and Philadelphia and in Delaware chemical concerns were founded to supply the needs of the colonists for salt, glass, potash, iron, lime, naval stores, gunpowder, and medicinals. It was these infant industries, started in the homes of the colonists, which gradually grew into the commercial organizations through whose efforts the United States became a leader in the manufacture of chemicals, even before the World War.

In 1638 cinchona was introduced into Europe as a result of the South American conquests of the Spaniards. This and other new drugs were being introduced into the apothecaries' shops of Europe when, in 1668, Friedrich Jacob Merck took over the pharmacy "At the Sign of the Angel" in Darmstadt.

The dawn of a new day was at hand. In 1661, the

Doorway of the Merck Research Laboratory, Rahway, New Jersey.

Irish aristocrat, Robert Boyle, the father of chemistry, published at the Ship in St. Paul's Churchyard, his great work "The Sceptical Chymist" in which he attacked and overthrew the principles proposed and defended by the generality of alchymists. From this work, which evoked little immediate response and which only came to full fruition a century later, sprang the revolutionary and fruitful ideas of Lavoisier, Priestley, and Dalton. The germs of the new knowledge spread to the New World which in turn produced eminent scholars and scientific pioneers in the persons of Rumford and Franklin who participated in the fundamental discoveries in the sciences of their time.

During the Revolutionary days the Continental Congress had encouraged the establishment of powder mills. Dyeing and weaving were important industries in those days and Samuel Wetherill, one of the promoters and managers of the "United Company of Pennsylvania for the Establishment of American Manufactures" established one of the earliest dyeing companies in the country. His son became a manufacturer of paints and chemicals in the early nineteenth century and a founder of the Philadelphia College of Pharmacy in 1821, twenty-three years before there was any school of pharmacy in England. The first president of the college was Charles Marshall, a member of a firm that made Glauber's salt and sal-ammoniac as early as 1786. John Harrison, who had studied under Priestley, erected a plant for the manufacture of sulfuric acid in 1804.

"A Hormone in the Making." Photo taken in the Merck Research Laboratory.

The time was ripe for the development of those chemical concerns from whose roots has sprung the present-day organization of Merck & Co., Inc.

John Farr came to Philadelphia in the early part of the last century and was devoting his attention to an investigation of the cinchona alkaloids when, in 1820, Pelletier and Caventou announced the discovery of quinine. Two years previously Farr had formed a partnership with B. Kunzi, a partnership that continued until 1836 when Kunzi retired. Farr then associated himself with Powers and with his own nephew, William Weightman, who was born in 1813 in Waltham, England. The firm became favorably known for the introduction of new chemicals and for the development of processes of manufacture. It was entirely due to the efforts of the firm of Farr, Powers & Weightman that cinchonidine sulfate became so favorably known and so largely employed as an efficient substitute for quinine, at a time when the high price of the latter product largely restricted its use. In 1875 the Elliott Cresson Gold Medal was awarded them by the Franklin Institute "for the introduction of an industry new in the United States and perfection of result in the production obtained in the manufacture of citric acid."

In 1822 two Swiss chemists, Zeitler and Seitler, formed a partnership for manufacturing chemicals in Philadelphia. Their accountant was George D. Rosengarten who had reached Philadelphia on a sailing vessel from Holland. He was a member of a family once wealthy but ruined by the Napoleonic wars. Becoming interested in the enterprises of the two Swiss chemists, he bought out their interests and for a time continued the business with Denis, a young French pupil of the chemist Robiquet. Realizing the value of education in business he sent his sons to Europe where they studied science, including chemistry, under the most eminent professors of their time.

In 1854 two sons were admitted to partnership and the firm name became Rosengarten & Sons. Later other sons were admitted, one of them, Adoph G., who was killed in a cavalry charge at the battle of Murfreesborough, Tenn., while senior major and in command of the 15th Pennsylvania Cavalry. The firm was continued by H. B. Rosengarten and his sons, the business being incorporated in 1901 under the name of Rosengarten & Sons, Inc.

With the discoveries and theories of Black, Cavendish, and Priestley a new era began. Medicine, pharmacy and the useful arts had prepared the soil upon which the seed of chemistry was to flourish. The rapid development of organic chemistry in the hands of Liebig, Kekulé, Bayer and their schools furnished chemical methods for the identification of the active principle of drugs and for the development of a grow-

ing list of synthetic compounds of therapeutic value discovered as a result of deliberate research.

The Engelapotheke, which has remained in the possession of the Merck family for two hundred and sixty-seven years, became the nucleus of the world-renowned house of E. Merck, for it was here that Heinrich Emanuel Merck, intimate and collaborator of the Darmstadt-born Liebig, became interested in the commercial production of alkaloids and started the house on its road from pharmacy to factory.

The scientific investigations of Seguin, Sertuerner, and of Dumas and Pelletier, had succeeded in thoroughly defining morphine, and by revealing the whole class of alkaloids had opened the way which led to great medicinal discoveries. E. Merck was personally acquainted with these investigators and shared their enthusiasm. He had the foresight to recognize the importance of morphine to medicine and, despite the advice of more conservative friends, undertook its commercial manufacture as early as 1827.

Gradually, changes in therapeutic methods, based on the new knowledge of the causes of disease, came about. Through the work of Pasteur, Koch, Lister and their successors it became recognized that infections were due to the invasion of the body by living organisms, and the preventive medicine born of this concept gave a new direction to the therapeutics of infectious disease. The specific action that had been unconsciously applied for the control of the infective organisms of various diseases in the traditional usage of cinchona, ipecac, mercury, antimony, etc. was proved and recognized together with the limitations imposed by the crude nature of the drug.

These inroads of chemistry into pharmacy, and the rigorous demands of modern medical science for standardized remedies, led to the gradual decline of the pharmacy as a manufacturing unit and the consequent growth of the great pharmaceutical supply houses in Europe and the United States.

In 1891, George Merck, the grandson of Heinrich Emanuel Merck, came to the United States to organize the American concern of Merck & Co. The business was started in a modest building in William Street, New York, and three years later the company began the manufacture of chemicals in a plant established at Rahway, New Jersey. At their factory in Rahway, Merck & Co. eventually manufactured morphine, codeine, cocaine, and many other chemicals, including salicylates, iodine preparations, bismuth salts, acetanilide, chloral, and prepared for the prescription counter almost the entire medicinal chemical requirements of the modern pharmacist.

It was in 1905 that the plant and business of Powers and Weightman were taken over by Rosengarten & Sons and the Powers-Weightman-Rosengarten Co. was established. Their many processes were added to and the business was expanded to supply a long list of chemicals. As the result of cooperation with Les Etablissements Poulenc Freres, the intravenous arsenicals arsphenamine, neoarsphenamine, and sulpharsphenamine were placed on the market and, in collaboration with the Rockefeller Institute, Tryparsamide. Among their products was also included a comprehensive list of high-grade reagent chemicals. In 1927 the consolidation of Merck & Co. of New York and the Powers-Weightman-Rosengarten Co., of Philadelphia, became effective.

Thus Merck & Co., Inc., was organized, with George W. Merck as president, and Frederic Rosengarten as chairman of the board. George W. Perkins is executive vice president and treasurer; James J. Kerrigan is vice president in charge of sales and merchandising and Joseph Rosin is vice president and chemical director.

Diorama of the main plant, laboratories, and offices of Merck & Co., Inc., at Rahway, N. J.

Behind the present day organization are the finest traditions of old and new world science—traditions held in highest respect by the management and employees—traditions which actively govern the policies of the company in the manufacture and distribution of fine chemicals for use by various types of industry, laboratories, physicians, dentists, pharmacists, chemists, and the general public.

The main plant, research laboratories, and offices of Merck & Co., Inc., are located at Rahway, N. J. and another manufacturing plant is situated in Philadelphia. Branch offices and warehouses are maintained in New York and St. Louis, and the factories of the Canadian subsidiary company of Merck & Co., Ltd., are located at Montreal, with a branch office in Toronto.

In addition to supplying nearly 3,000 products in various forms to many classes of industry and the drug trade, Merck & Co., Inc., issue several publications for the service of physicians, chemists and pharmacists. Among these are *The Merck Manual of Therapeutics and Materia Medica*; the *Merck Index*, an encyclopedia of chemicals and drugs used in chemistry, medicine, and the arts; and *The Merck Report*, a service magazine published in the interests of pharmacy.

The high position held today by the medicinal chemical industry among industrial organizations is due, in no little way, to the fact that the ethical standards of the principal manufacturers throughout the last century have been rigorously upheld. The fine standards of quality maintained, the careful observation of ethical codes, the institution of research organizations, and cooperation with hospitals, clinics, and with privately and publicly-endowed research institutes have made possible enormous contributions to the alleviation of human suffering.

Today through the labors of the research, control, and factory chemists of the leading manufacturing houses there are available for medicinal uses chemicals which conform to the rigorous standards set by the U. S. Pharmacopoeia and the National Formulary, and remedies which stand accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

The need for research undertaken in the spirit of free inquiry, often with no immediate practical or probable result other than the increase of fundamental knowledge, has been recognized and provided for by the establishment of new research laboratories. In 1933 Merck & Co., Inc., dedicated the Merck Research laboratories at Rahway, New Jersey. These laboratories are adapted to the often difficult synthesis of complex organic compounds and are suited to the chemical and physical preparation and purification of unstable natural principles. With them are amalgamated laboratories for pharmacological investigations equipped with facilities for bacteriological and experimental therapeutic studies and in them, today, work is being carried on in the main fields of medicinal chemistry. Among the products already produced, Vinethene, a new inhalant anesthetic, and Mecholyl, a new choline product, are perhaps the most outstanding.

No longer is the producer of medicinals mainly interested in the production of fine quality, standardized therapeutic specialties but, through research laboratories and in cooperation with outside workers in hospitals, clinics and academic laboratories the manufacturer of fine chemicals takes a large part in the development of the main trends of modern medicinal and chemical investigation. His ideal is to provide medical science with such remedies as will meet its present specific requirements and to endeavor to realize the ideal medicaments of which the physician and surgeon dream.

Much has been done but much remains to be accomplished; and only by constant application, by thoroughgoing research, and by the ethical conduct of the medicinal chemical industry and its ready cooperation with the outside academic world, can true progress be made so that the scientific dreams of the present may become the medical realities of the future.

Toward that goal, Merck & Co., Inc., with its rich tradition of experience, its adequate resources and modern facilities, goes forward with confidence and the desire to serve.

The Merck open-view prescription desk in a modern pharmacy.

Columbia Alkali

and the Story of an Industry

LIFT a hand, turn an eye, the influence of alkali is everywhere. The room in which you are now sitting, the objects that fill it, your trip from home to the office, your business activities, your meals, your recreation, your sleep . . . all are evidence of the tremendous rôle that alkali plays in modern life.

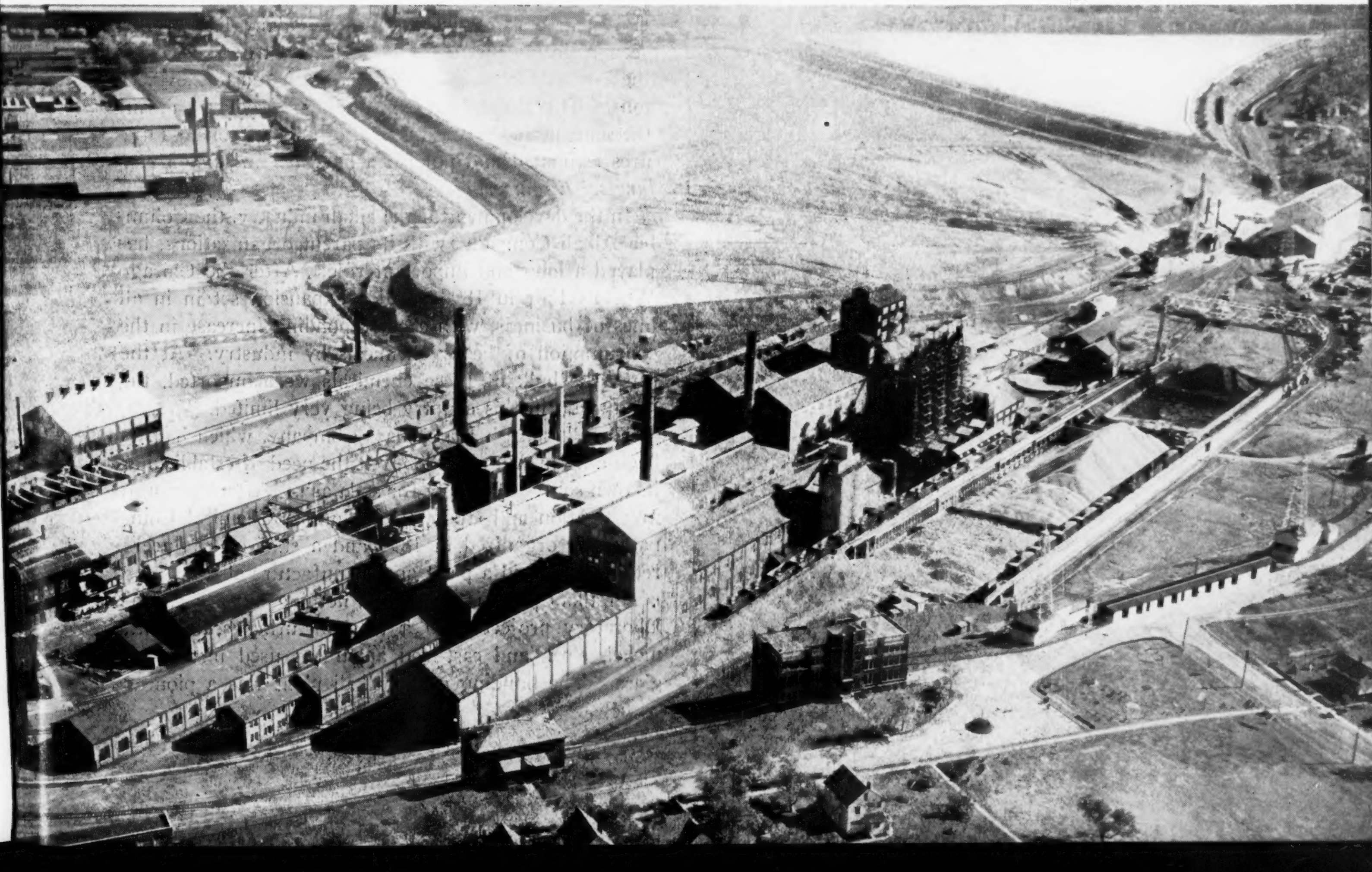
The lamp that lights the room—its bulb is glass; the little ring in the base is glass, the wires are set in glass. The window panes are glass—the flower vase is glass—the face of the clock, the mirror, the ink-well, the pictures, the ash-tray, the thermometer stem, a door knob—all glass. Glass around you everywhere in this room, in other rooms, in your car, on the train, and now glass houses—tons upon tons of glass. And glass is made of soda ash, sand and lime.

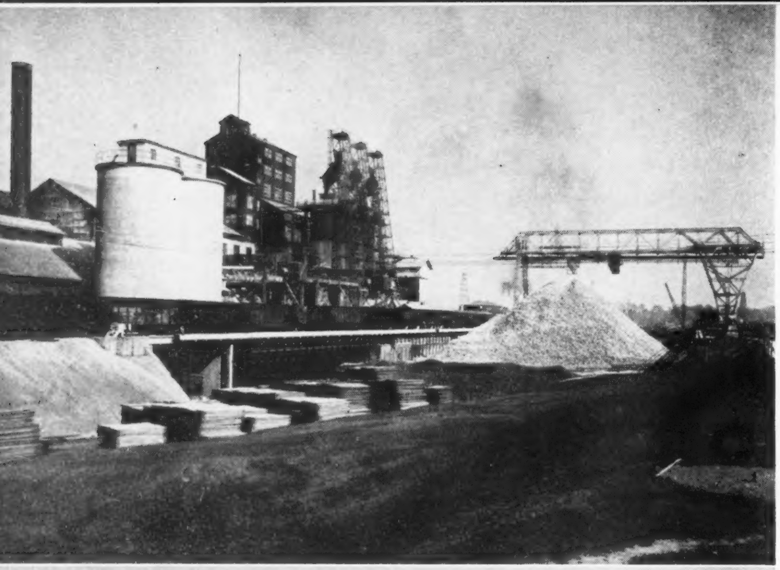
The rug on the floor is made of wool which was cleaned and scoured with soda ash, as are all wool materials—your hose, your suit, your sweater, your latest wool tie, and perhaps much of the upholstery on the furniture about you.

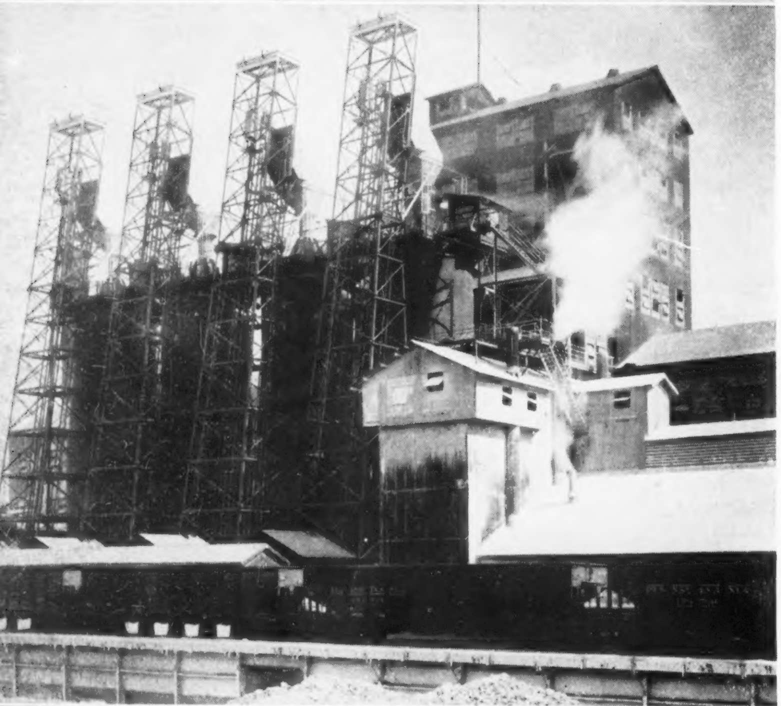
The curtains on the window are cotton. Their fibers were cleaned, kier-boiled they call it, with caustic soda before they could be bleached and a finished product produced. Each year millions of pounds of cotton are converted into the textiles which you see all about you—and the first step in processing requires alkali.

The chemist has borrowed the silkworm's secret and produced beautiful rayon drapes for windows. How different they look from the caustic soda and wood pulp from which their fibers are produced. The "Cellophane" wrapper on that candy box, on the cigarettes and on cigars is simply rayon in sheet form—alkali again.

Pick up a book or magazine and thumb the pages—quality paper made by cooking wood pulp and rags in alkali. Is that a copper ornament over the fireplace? The great copper companies all use alkali in refining . . .







And *there* is a piece of plated silver. Before plating, it had to be cleaned with alkali. Likewise, millions of utensils are cleaned in alkali before their surfaces will take the beautiful finishes that delight the eye.

What of the leather-covered chair you are sitting on? Leather makers use alkali for neutralizing. And the fine quality chrome tanned leathers in our shoes? Soda ash must be used to obtain the chrome from the chrome ore.

For your daily bath, it is quite possible that you are using municipal water that has been treated with soda ash to render it soft and to prevent rusting of pipes. In any event, you are using soap which is made from caustic soda, fats, and oils. Thousands upon thousands of tons of soap are used annually for washing a great variety of things. Modern sanitation and cleanliness would be impossible without it. Alkali again.

Coming home today, you had a fast ride in your car. Do you realize that the gasolene which furnished the power was "sweetened" with caustic soda? In the number of its products and in the extent of their use, the petroleum industry is truly a gigantic one. And in the basic processes of refining, alkali plays an important part.

. . . .

The story of alkali is a story that goes on and on. The modern world is filled with objects that are useful, objects that increase efficiency, objects that bring beauty and happiness into people's lives. And nearly all of these products upon which our very existence depends—products of industry, art, and commerce—have been associated with alkalies, either directly or indirectly, during some stage of their manufacture.

Some idea of the size of the alkali industry and the extent to which it enters into our daily life may be seen from the fact that the total output of soda ash in the United States in 1934 alone amounted to 2,390,000 tons. The amount of caustic soda produced during the same period reached a total of 735,000 tons. (Figures estimated and published by *Chemical and Metallurgical Engineering.*)

In the development of the alkali industry, the Columbia Alkali Company, with its parent organizations, has played a long and important rôle. After the Chicago World's Fair in 1893, a wide expansion set in in all lines of business, with a corresponding increase in the consumption of heavy chemicals by industry. At the time, the bulk of these chemicals were imported, the production in this country being very limited.

The Pittsburgh Plate Glass Company, which had its beginning in August, 1883, felt the need of establishing its own source of supply for soda ash. After thorough investigation and study, the Columbia Chemical Company was organized in 1899 and a staff of engineers retained to build a plant and manufacture alkali.

An alkali plant is, in reality, nothing but a chemical laboratory projected on a manufacturing scale, with nickel, steel, and cast-iron apparatus used instead of glass. The building of an alkali plant was a pioneer

step for Columbia to take, back in the 90's, at least for this country—and it was over a year before the plant was finished and actually put into operation. The first soda ash and caustic soda were turned out at the new plant November 1, 1900.

. . . .

Barberton, Ohio, eight miles from Akron, was selected as the site of this new plant because of the salt deposits there, the availability of limestone, the ample water supply, and the excellent transportation facilities to great industrial centers. The source of limestone was Columbus, Ohio, until 1918, when it was deemed advisable for the company to control its own limestone deposits. Properties were acquired at Fultonham, Ohio, near Zanesville, and a crushing and screening mill was built to supply limestone of proper size for the chemical operations at Barberton.

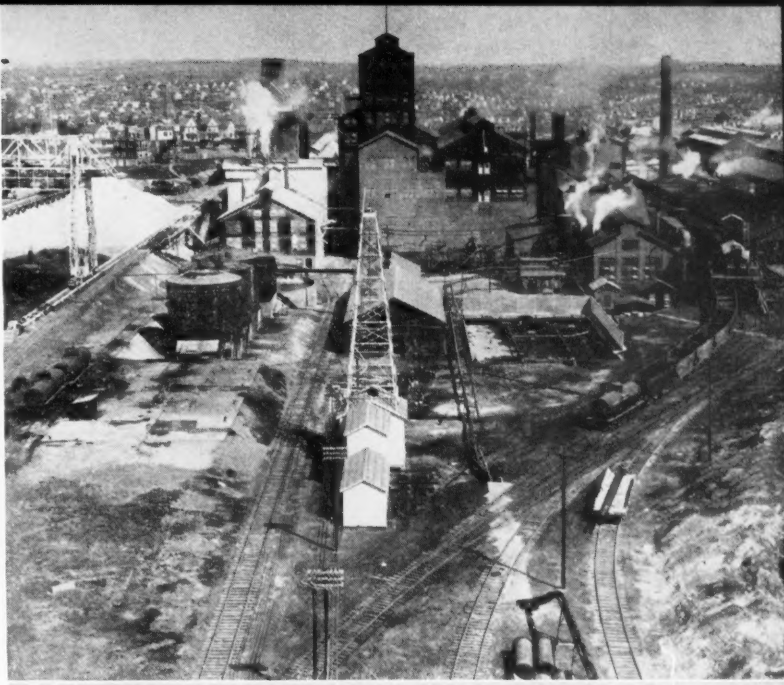
The Columbia Chemical Company continued as a separate corporation until 1920 when it was merged and became known as the Columbia Chemical Division of the Pittsburgh Plate Glass Company. In 1931 the Columbia Alkali Corporation was formed to take over the sales of the products of the Chemical Division.

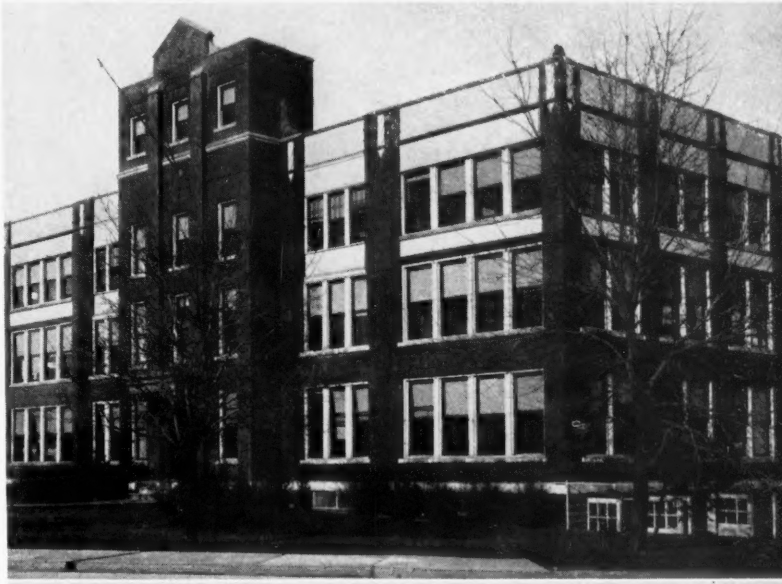
As one of the principal alkali producers, Columbia has steadily expanded its facilities and devoted years of unceasing research to the production of alkalies most perfectly adapted to meet every modern industrial requirement.

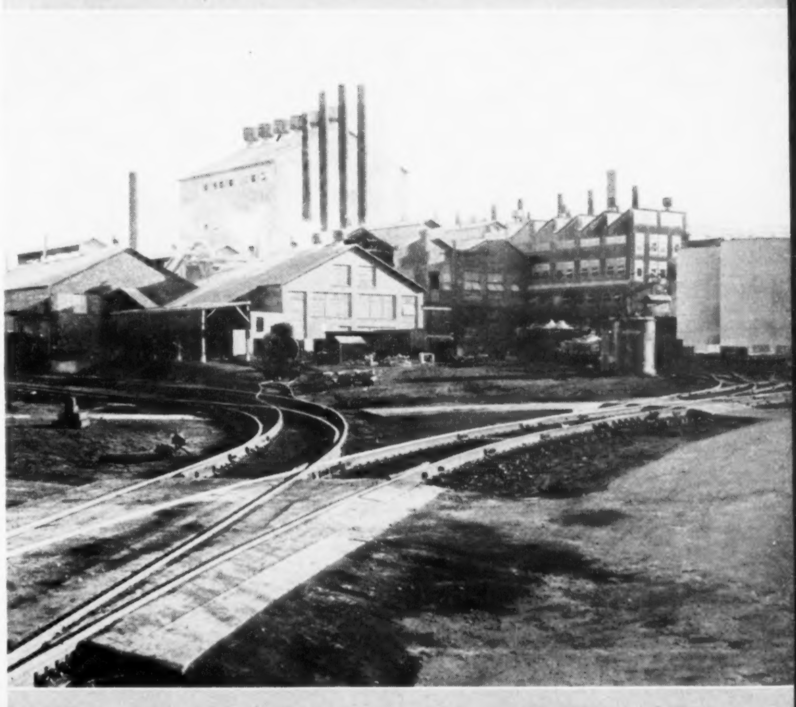
As an example of this leadership, Columbia was the first alkali-producing company to recognize the fact that for the glass industry it is not enough that a dense soda ash be granular, dense, and dustless. Granulation and density must bear the proper relationship to the other batch ingredients used to attain the best results. As a result, Columbia perfected, *three* standard grades of dense soda ash for the glass manufacturer to choose from—three grades differing in density and grain size but of the same chemical composition.

Columbia was likewise the first alkali producer to market flake caustic soda in *three* different standard size flakes. In an industry where adaptability of materials to various manufacturing processes and ease of handling them are so vital, these refinements assume major significance.

Among the special products developed by Columbia is a new calcium carbonate pigment called Calcene. It is a product of recognized importance in the rubber industry. Rubber stocks compounded with Calcene are characterized by high tensile strength with good elongation and exceptionally good resistance to tear and abrasion. Another Columbia development is Col-Rec —a specially prepared product having a calcium chloride base, and containing in addition several active ingredients which improve the burning qualities of coal and coke. In addition to these, Columbia Alkali has developed other important chemical specialties and is constantly carrying on extensive research with a view to perfecting new ones.







Chemistry

in the California Citrus Industry

CHEMISTRY in one of its most diversified practices plays an important rôle in one of America's leading food products industries. The California Fruit Growers Exchange is a marketing organization for the sale of fresh fruit under the well-known Sunkist Brand. In order to cope with the ever-increasing problem of surplus and its control, the organization added to its operations a manufacturing arm. This branch of the business deals solely with the surplus crops.

The manufacturing activities of the Exchange growers comprise two complete operations; Exchange Lemon Products Company, dealing exclusively with the disposal of lemons, and The Exchange Orange Products Company, handling oranges.

In order to dispose of the surplus most advantageously and at the same time introduce to America and to the world, products from that surplus fruit which would add to the ever-increasing demands for healthful food and meet the demands for purity exacted by the several nations of the world, this company engaged the services of a corps of thoroughly trained chemists. This group of technical men are under the direction of a man not only expert in chemistry in general but the chemistry of citrus fruits in particular.

The duties of these men were to give to the two producing plants methods by which the various constituents of the fruit could be separated and made into products of commercial value.

Out of their work came five basic products, citric acid, essential oils, juice, pectin and pulp. Further work on each of the basic products brought forth uses applicable to many lines of food products.

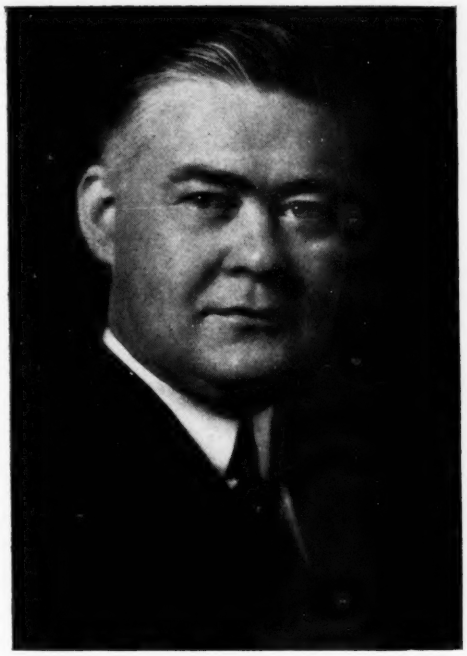
It would be of surprising interest to many of you to know the extent to which the application of chemistry in our business has led to other fields.

In a broad sense our products find their way in other industries as far removed from each other as baby feeding and quenching steel. In another direction our products can be found in some of the finest cosmetics, catering to the high priced field, down to the small bottle of soda water that can be purchased for a nickel at the road stand.

One of our most interesting products is citrus pectin, which while primarily manufactured in the early days for jam and jelly work is now used in many food products and has even penetrated the realm of the highly technical and most exacting work of the X-ray.

Space will not permit further discussion but we invite the chemists to visit our plants when in California and become acquainted with the scientific men in our organization who speak their language.

Our success, of which we are justly proud, has been made possible because chemistry has been unselfishly employed.



FRANCIS J. MC DONOUGH
President of The New York Quinine & Chemical Works, Inc., since 1925.

Making Chemicals since Paul Revere made his famous ride.

EVER since the day that Paul Revere made his famous ride from Boston to Lexington on April 18, 1775, chemicals have been produced on the site where the plant of The New York Quinine & Chemical Works, Inc., now stands, in what was then known as the town of Williamsburg. In those exciting days, the story is told, a plant was engaged in the production of saltpeter, potash, and gunpowder. It is probably one of the oldest sites in America continuously devoted to the manufacture of chemicals.

After the Revolutionary War the plant made soap and other chemical products. In 1885 the manufacture of quinine and various salts from cinchona bark was first undertaken. The present N. Y. Q. plant traces its history back through over half a century to the modest beginnings of these pioneers in medicinal chemistry, and its association has been identified with chemistry for nearly two centuries.

Necessity for Expansion

The quick development of the business started by the early pioneers, together with many important research developments both in this country and abroad, led to the production in a commercial way of certain varieties of cinchona salts of special value to the medical profession. These developments took place in the early 80's.

To carry on further the commercial production of cinchona salts, research expeditions were made into the mountainous regions of South America. Here the cinchona trees grew in a wild state, and it was possible to examine them closely in their natural environment. Within a year several important discoveries were made. The result of this expedition focused the eyes of the medical profession on these men of N. Y. Q. as the foremost authorities in America on the chemistry of the cinchona salts. The contributions made by these men on cinchona salts were invaluable and resulted in further expansion of the business. As one of the results, in 1886, the company was incorporated under the name of New York Quinine & Chemical Works, Ltd., and sales offices were opened at 35 Liberty Street, New York City. At this time many of the men associated with the New York Quinine & Chemical Works were looked upon in the chemical and drug trade as among the leaders in the industry.

Company Active in Research

During the first few years the New York Quinine & Chemical Works directed its energies chiefly toward the development of cinchona salts, but at the same time it adopted very early in its history a progressive attitude in its research and in the introduction of new medicinal chemicals. Morphine and other opium products were manufactured. Additions were constantly being made to the plant in order to produce bismuth salts, iodides, strychnine and various glucosides. The New York Quinine and Chemical Works was the first in this country to produce acetanilid and synthetic menthol, the latter being identified to the discriminating by the trade mark, "Menthol-Y."

The year 1916 marks another important milestone in the progress of The New York Quinine & Chemical Works, as an extension of its plant was started on the site of the original chemical works that operated there during the Revolutionary War, and plans for a large additional construction are now developing.

In 1925 the corporate title was changed to The New York Quinine & Chemical Works, Inc., and Francis J.

McDonough, formerly vice president of McKesson and Robbins, became president, in association with Irving McKesson and Donald McKesson. Since that time the plant has grown tremendously, and many improvements have been made. New products have been added to the line, and the sales of the company have increased in a most gratifying way. Because of the important medicinal character of many of the company's products, greater emphasis than ever has been placed on the laboratories for research and control. Today these divisions are modern models of efficiency.

To appreciate fully the services of this company in the chemical growth of the country it is necessary to know that it was one of the two pioneers in the manufacture and gradual perfection of the cinchona salts, that for fifty years it has been supplying an exceptionally high quality quinine, and that it has gradually added to its line until today it serves the pharmaceutical and the wholesale trade by producing a very complete line of fine and medicinal chemical compounds.

With a completely remodeled plant, equipment of the latest design, extensive research facilities, and a thoroughly progressve management, the future should hold even greater achievements than have been witnessed in the past fifty years. One of the very earliest chemical industries of Brooklyn, it has survived where others have failed. In an era highly competitive, the New York Quinine & Chemical Works stands firmly entrenched in a very prominent position in the field of chemicals for medicinal and industrial uses. By the letters "N. Y. Q.," New York Quinine & Chemical Works, Inc., is informally known all over the country.

The officers and directors of the company are: Francis J. McDonough, president; Irving McKesson, vice president and secretary; Donald McKesson, treasurer; and Hans Kellner, assistant treasurer.

The plant occupies the blocks of North 11th, North 12th, and Berry Streets, Brooklyn, New York.

The New York Quinine and Chemical Works laboratories, Brooklyn, N. Y.

A Key Industry

The Texas Gulf Sulphur Company and Its Important Product

CONTRARY to the experience in the production of most minerals, where definite operating schedules can be planned in advance and mining costs closely estimated, a sulphur deposit in the Gulf Coast region does not become a mine until a large tonnage has been produced. Successful operation depends on underground conditions, many of which cannot be foreseen, and the final test of the deposit lies not only in the production of sulphur but in the efficiency of the hot water as a melting agent. Texas Gulf Sulphur Company has had three opportunities to use the commercial production of sulphur as a check on the results of its drilling campaigns and its engineering estimates, and in each case where the deposit was actually "steamed" it proved to be a commercial producer.

Boling Dome, where the company's Newgulf plant is situated, contains the largest deposit of sulphur ever found in the Gulf Coast area. Production of sulphur at Newgulf has been uninterrupted since March 19, 1929, and since 1932 the mine has been the largest producer in the world. At this deposit where commercial sulphur was first indicated in 1927 there now stands a modern town to house the mine workers, water reservoirs, power plant, and miles of pipe necessary to transport the superheated water to the wells and the molten sulphur to the storage vats. Many millions of dollars were spent in drilling, developing and equipping the property before a single pound of sulphur was brought to the surface. In approximately 20 months from the date of first discovery, an immense area was drilled, and a plant capable of producing several thousand tons of sulphur per day was constructed and in full operation. The success of a new enterprise was demonstrated, and a new community was definitely established. It was designed for the most healthful living conditions for employees, containing hospital, modern homes and school buildings together with stores and recreation facilities. In each of the larger mines the experience was somewhat the same.

The American sulphur industry, which now leads the world, was practically non-existent before 1903, when a shipment of 3,000 tons of sulphur was made from Louisiana to New York. It was obtained from two wells operating the Frasch or hot-water process at Sulphur Mine, Louisiana, which deposit was later to produce almost 10,000,000 gross tons of the yellow mineral. The rapid rise of the United States sulphur industry to world prominence is demonstrated by the following historical notes:

1904—First full year of production averaged 190,000 tons.

1906—Union Sulphur Company was able to enter the foreign markets.

1912—Freeport Sulphur Company started operations at Bryan Heights, Texas.

1914—The American mines produced more sulphur than those of Sicily.

1917—United States produced over a million tons.

1919—Texas Gulf Sulphur Company started operations at Big Hill, Texas.

1923—United States production exceeded 2,000,000 tons.

Sulphur—a pure natural product. Loading face of the vat at Newgulf, Texas.

Gulf, Texas, located beside one of Texas Gulf's great sulphur domes.

1929—Several new sulphur operations started, the largest being that of the Texas Gulf Sulphur Company at Boling Dome.

1930—United States production exceeded 2,500,000 tons.

Indications of sulphur were first found at Big Hill, the original deposit of Texas Gulf Sulphur Company, during an oil boom which existed in the period from 1901 to 1904. However, there was already more productive capacity than there was a market and it was only the persistent demand of the United States Government in 1918 that led to the assembling of sufficient property for development. Once started, development was rapid and in March, 1919, sulphur was first produced. In less than a year production reached almost 2500 tons a day, a figure which could have been increased had the demand required it.

In 1924 Texas Gulf Sulphur Company became the largest in the industry. The pioneer, Union Sulphur Company, had completely exhausted its Louisiana deposit, and there remained only Texas Gulf Sulphur Company with its deposit at Big Hill and the Freeport Texas Sulphur Company with its deposits at Bryan Heights and Hoskins Mound. Since that date other deposits have been reported; and Boling Dome, Long Point dome and Palangana dome in Texas, and Lake Peigneur and Grand Ecaille in Louisiana, have been brought into production.

The American sulphur industry has thus been firmly established through the activity of the producers in finding and developing deposits, so that today the known reserves are in excess of 50,000,000 tons, or almost five times as much as were known ten years ago.

Much has been written about the unique method of mining and about the vast stocks which are ready for shipment at the different deposits. Very little of the sulphur, however, is seen by the average individual, so that it is sometimes difficult to visualize the important part it plays in our industrial life and the large tonnages which are required in order that our every day needs may be satisfied. Even in 1932 when business seemed to be at a standstill, over three-quarters of a million tons of sulphur were used in the United States; and under the slightly improved conditions of 1933, over 1,000,000 tons were consumed. Because of the widespread uses and the numerous direct and indirect products, sulphur and sulphuric acid are reliable indices of industrial activity.

During 1933 the distribution of sulphur among broad subdivisions of industry was as follows:

Chemicals	491,000 long tons
Fertilizers	242,000
Pulp and Paper	197,000
Explosives	37,000
Dyes	40,000
Rubber	24,000
Paint	4,000
Food	4,000
Miscellaneous	75,000
	1,114,000 long tons

The chemical industry converts the major portion of its sulphur purchases into sulphuric acid, which in turn is consumed either in the preparation of chemical products or by other industries, as, for example, in oil refining, steel pickling, and electrochemical processes.

The main uses of sulphuric acid in short tons of 50° Be. acid were reported for the year 1933 to have been as follows:

Fertilizers	1,206,000
Petroleum	1,150,000
Chemicals	725,000
Coal Products	468,000
Iron	390,000
Metals other than iron	360,000
Paint	170,000
Explosives	140,000
Rayon	242,000
Textiles	90,000
Miscellaneous	233,000
	5,174,000 short tons

In the fertilizer industry the principal use for sulphuric acid is for the manufacture of superphosphate. Washed phosphate rock is treated with the acid, which not only makes the phosphorus available for plants but also furnishes sulphur which is, in itself, a plant food.

In recent years large sums have been expended in research looking to the production of phosphoric acid by thermal methods, without the use of sulphuric acid. The phosphoric acid so produced has found a market in the preparation of foodstuffs, but the lack of sulphur in the finished product decreases the all-around value of the product for agricultural purposes.

Sulphuric acid is also finding a direct use in agriculture. In England and in France a considerable tonnage is used for the control of weeds among growing crops, and experiments are being carried on in California to determine its value as a weed control in this country.

Most of the lubricating oils, gasoline, and kerosene are treated with sulphuric acid during the refining process.

In the metal industry, particularly steel, sulphuric acid is used in cleaning sheets, wire, and shapes preparatory to the coating, whether such coating is zinc, tin, or of the enamel type.

The common form of gunpowder known to Western civilization for many hundreds of years, consists of charcoal, saltpeter, and sulphur. Modern industrial explosives use very little sulphur as such but require large amounts of sulphuric acid in their preparation.

Rayon requires sulphur or its products in various stages of its manufacture. It is used in the production of the wood cellulose, the raw material for both rayon and cellophane. Carbon bisulphide converts the cellulose crumbs into viscose, and sulphuric acid hardens the threads as they are extruded from the spinnerettes.

The sulphite pulp industry ranks second to the sulphuric acid industry in the amount of sulphur consumed. Its product finds its way into our best book and ledger papers as well as into the newsprint and pulp of our daily papers and magazines. In this industry approximately one-tenth ton of sulphur is consumed for each ton of sulphite pulp manufactured. The sulphur is burned to sulphur dioxide and combined with lime in solution to form calcium bisulphite, which dissolves the lignin and other materials present in wood, but leaves the cellulose structure unimpaired. The cellulose so collected constitutes the sulphite pulp of commerce and may be used in the manufacture of rayon or Cellophane or prepared into sheets of fine paper. By mixing with ground wood, newsprint is produced.

The coal-products industry uses sulphuric acid in recovering the ammonia during the coking of coal and again in the preparation of many of the derivatives from the tar itself. Ammonium sulphate is a very important source of nitrogen for agriculture and has a second and important value in supplying to the soil the sulphur normally removed in cropping operations.

Rubber was first vulcanized by Dr. Goodyear through the employment of sulphur. It continues to be the chief vulcanizing agent of the great rubber industry of today.

The made-to-order town near Boling Dome, world's greatest sulphur producer. Main street of Newgulf, Texas.

Many of the pigments used in paint are compounds of sulphur. Lithopone contains both zinc sulphide and barium sulphate. The titanium oxide now so commonly used requires sulphuric acid during its manufacture.

Sulphur dioxide is required in the production of sugar from beets and cane, and for the preparation of corn syrup and related products from corn. The dried fruit industry uses sulphur in setting the natural juices of the fruit.

Sulphur burned to sulphur dioxide is a mild bleaching agent used in the bleaching of wool, feathers, and the straw for hats.

Ground sulphur has definitely increased the growth of alfalfa in the alkaline soils of the Northwest, and is used as a dust in the controlling of pests in vineyards, orchards, and citrus fruit groves. Recently ground sulphur has proved effective in the control of the cotton flea hopper, one of the new and growing pests afflicting the cotton crops of the South.

Lime-sulphur solution, prepared by reacting sulphur and lime to form a polysulphide, is used for spraying fruit trees of all varieties.

Sulphur combined with unsaturated olefines gives a plastic material known under the copyright name of Thiokol. It has properties similar to those of rubber and many that are superior.

Ship-loading pier, Galveston, Texas.

While the use of sulphur combined with sand for the preparation of a quick-setting cement has been known for many years, Mellon Institute has recently announced an improved product, the plasticity of which can be varied by the addition of certain chemicals. It apparently has great promise in the construction of electrolytic cells, continuous pickling tanks, electroplating tanks, as well as flooring where acid-resisting jointing material is required.

To name the entire list of sulphur and sulphur-compound users would be to call the roll of industry. All are dependent upon some physical attribute or chemical property of sulphur or a sulphur-containing substance. Thousands of individual products which have met sulphur in some form during fabrication reach the ultimate consumer. This fact is of national economic importance.

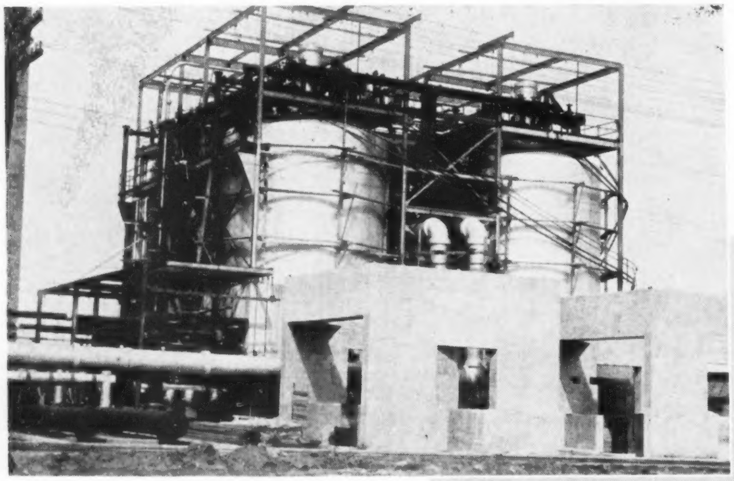
One writer has stated, "It is no exaggeration to say that sulphur is a constituent of, or a necessary reagent in, the manufacture of a large proportion of the articles in common use today. The average man does not suspect that sulphur is a raw material in the making of the paper of the magazine he buys, the coloring matter, glue, and photographic reproductions required; of the motor fuel, lubricant, tires, and upholstery of the car he drives; of the leather in his shoes, the paint on his house, the galvanizing of its screens, the dye in rugs, the soap he washes with, the preservatives in his foods, the fertilizers that helped grow his foodstuffs, and the glassware on his table."

It is to the credit of the American sulphur industry as a whole and the inventive genius of those who have contributed to its development that this exceptionally pure mineral product can be marketed at a selling price of less than 1¢ a pound. This is true despite the necessity for amortizing prospecting and development costs ranging from $50,000 to $1,000,000 and for depreciating plant equipment costing from $500,000 to $7,000,000. The management must risk these expenditures before commercial production on a new dome demonstrates the wisdom of their investment, and before the value of the property is proved.

The Gulf Coast producers are faced with competitive effort elsewhere. For example, in addition to the large quantities of pyrite consumed throughout the world, about 1,000,000 tons of sulphuric acid, equivalent to 200,000 tons of sulphur, are recovered annually from smelter gases in the United States alone. Today, besides the seven points of production along the Gulf in Texas and Louisiana, two surface deposits are being operated in California and one in Utah. A process for direct recovery of elemental sulphur from sulphide ores has been developed; and in Norway, Spain and Portugal this product is being marketed.

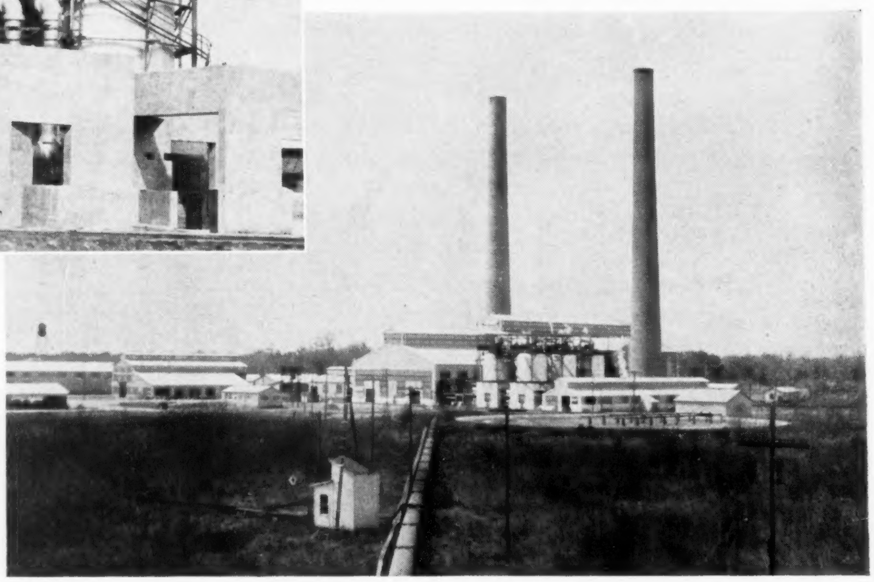
Sulphur production in the United States is well below the output of coal and iron but is in excess of the quantity of metallic copper or lead produced annually. It ranks 17th in the tonnage of mineral matter brought to the surface of the earth; but if the ranking were on the basis of pure elemental content, a much higher place would have to be assigned because of the fact that run-of-the-mine sulphur is over 99½% pure.

An industry that can point to such tonnage production, and to a product so essential to the great industrial fraternity, is, without question, a key industry.



Above, two units of the Newgulf water-softening plant.

Below, making the power at Newgulf.



Aluminate

for Boiler Waters

PROGRESS in the treatment of boiler feed-water, which had been at a standstill for years, was revived with the development of sodium aluminate as a water-treating chemical. That the two were coincidental was due not merely to the then new chemical but to the dissatisfaction with current methods of treating water and to persistence and determination in seeking an improvement.

In 1922 the engineer in charge of water treating for one of America's largest industries became definitely interested in securing samples of sodium aluminate for experimental work. The C. P. product then on the market was out of the question on account of price, and the ordinary dry product available was of low grade and not in usable form. The search led to the Aluminum Ore Company at East St. Louis, where a liquid used in the process of making alumina and containing about 17 per cent. $Na_2Al_2O_4$ was secured.

A usable product was now at hand, but how should it be used? No literature being available on this subject, the engineer began research along practical lines, which resulted in greatly improving operations with lime-soda softening plants and in revolutionizing the treatment of water directly in boilers.

The original sodium aluminate liquor contained solids which settled when the liquor was cool. It had to be stored in heated tanks to keep the solids in solution until the liquor was used. In spite of this disadvantage (which was later overcome by producing a stable solution) definite satisfactory results were obtained, and the treatment was rapidly extended to the various plants of the company.

A small company known as the Aluminate Sales Corporation was formed to put the product on the market. In 1923 the Chicago Chemical Company took over the sale of sodium aluminate to industrial plants, and the Aluminate Sales Corporation confined its efforts to railroads.

Up to this time no definite control of internal (in the boiler) treatment had been developed, and the first step in this direction was a small soap-hardness testing kit. Persistent educational work was necessary to convince engineers of the importance of this test.

From this small beginning has grown quite an elaborate but simple system of testing, for soap hardness, "P" and "M" alkalinity, chlorides, dissolved solids, sulphates, CO_2, pH, and others. Testing equipment has been constantly improved, and a regular department for furnishing testing supplies was started. In 1926 a special catalog of water-testing equipment was issued.

As progress in sales depended upon the successful use of the product sold, constant study of water-treating problems was made; a regular service department was inaugurated, and every customer receives this service at no additional charge.

The use of sodium aluminate in external treating plants with lime and soda ash was also developed, and in 1927 patents were issued covering this process.

While the art of water treating progressed, the sodium aluminate was improved to the point where a 32 per cent. stable solution was made. Then came the production of a dry product containing 77 per cent. $Na_2Al_2O_4$ but rather high in insolubles. Today the regular commercial grade averages over 90 per cent., and a C.P. grade 100 per cent. soluble is also produced and sold at a low price.

In order to coordinate sales, research, and related problems, the National Aluminate Corporation was formed in 1928, bringing together the Aluminate Sales Corporation and the Chicago Chemical Company.

Extensive research work has been under way for several years, not only in the company's own laboratory, but in different universities. While research is devoted primarily to water-treating problems, a great deal is directed toward new uses for sodium aluminate, a number of which have been definitely proven and patented. The company now owns and controls an impressive list of patents on the use of this chemical.

The bibliography of sodium aluminate now includes over one hundred and fifty articles. The product itself has been improved to a point where it is almost perfect. Its value in water treating is almost unanimously acknowledged by mechanical and chemical engineers who have had opportunities to use it. Water-treating costs have been greatly reduced, and cleaner boilers and related equipment have reduced operating costs.

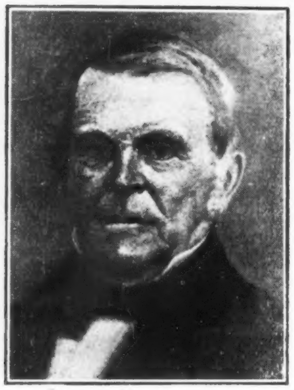
Sodium aluminate also has a definite place in industrial and municipal filtration.

There is no doubt that the success achieved with this product has been due as much to the intelligence displayed in its promotion and use as to the product itself. Sodium aluminate is not any more fool-proof than any other chemical, and must be used intelligently and with full knowledge of what it can and cannot do, if it is to be used successfully.

The development of higher boiler pressures and temperatures during the past decade has introduced new problems involving more exacting requirements in feed-water treatment and control, all of which are being successfully handled by National Aluminate.

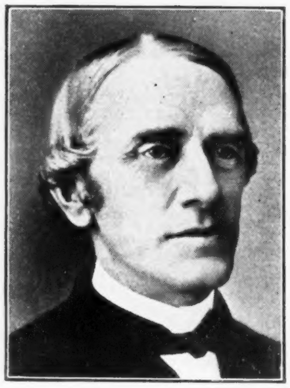
In addition to sodium aluminate, the company now provides complete chemical treatment for any condition. In the railroad field special equipment has been designed for the exclusive use of the company's products.

Any reader sufficiently interested is invited to visit the experimental laboratory of the National Aluminate Corporation, 6216 West 66th Place, Chicago, Illinois, or to write if he desires consultation on any water-treating problem.



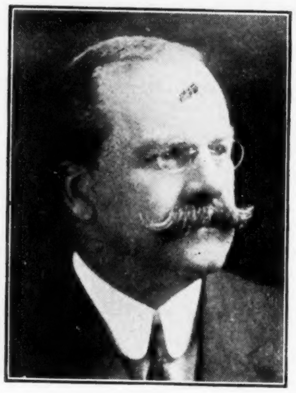
NATHAN GIFFORD

Who with Aaron Innis and Howland Sherman was founder, in 1816, of Gifford, Sherman and Innis.



GEORGE INNIS

Partner 1844-1857; owner 1858-1884.



WILLIAM R. INNIS

Who with Hasbrouck Innis was a partner 1884-1904.

CLEMENT C. SPEIDEN

President 1906-1925; Chairman of the Board 1926.

One Hundred and Nineteen Years

Innis, Speiden and Company 1816-1935

GEORGE V. SHEFFIELD

Owner 1904-1905; Vice President and Treasurer 1906-1934.

WHEN Napoleon was at Elba, there began in the United States a commercial enterprise which has survived the fall of more than one empire and is still serving industry today. Innis, Speiden and Company grew out of a very early American chemical need. President Jefferson had declared an embargo on shipping; and the embargo, in turn, had stimulated the growth of an American textile industry, eagerly supported by American patriots. At his inauguration President Madison wore a suit made entirely from wool grown and woven in the United States.

Dyes, however, were still imported. In those days all dyes were natural products, prepared for the most part from raw materials collected in Central America, shipped to Europe, and sent back as finished dyes to the United States. But in 1816, the idea of American chemical independence was abroad in the land. Nathan Gifford saw the advantage of being chemically free of foreign domination, and he built a dye-wood cutting plant at Poughkeepsie, so as to be near the textile mills of New England and Pennsylvania. His capital proved to be limited, however, and to give the new American industry a real start, Gifford appealed to Aaron Innis, a leading Poughkeepsie merchant, for financial help.

Convinced a new American dye plant was needed Mr. Innis furnished the necessary funds, installing his son-in-law, Howland Sherman, as one of the partners. This firm now opened a New York warehouse to stock its products, and soon enlarged the line to include such East Indian products as indigo, turmeric, lac, and cutch.

Thus became established, the company's present policy of carrying stocks of chemicals at centrally located distribution points for the convenience of their customers. In those early days the customer's needs were many. The firm undertook to supply all the chemicals needed for mordanting, bleaching, and dyeing; and built upon the firm foundation of a national need, it grew and prospered.

In 1904, George V. Sheffield acquired ownership. Two years later the company was considerably enlarged and diversified by merger with the chemical interests of C. C. Speiden and Marion Speiden, the company taking the name of Innis, Speiden and Company. This change brought into the firm the vigorous personality of C. C. Speiden; and it was through his guidance that the modern development began, aided by George V. Sheffield, who continued to lend his active assistance in the requirements of the rapidly growing and progressive organization.

From 1906 to the beginning of the World War the

business increased tenfold, and the company's reputation and good will developed at home and abroad.

A first step in meeting the changed chemical markets brought about by the World War was the erection at Niagara Falls of a large electrolytic chlorine plant, under the direct supervision of Eben C. Speiden. This plant operated as the Isco Chemical Company, Inc. When America entered the war, Isco was ready to help supply the vast quantities of chlorine and chlorides the country needed for gas and munitions.

The products first manufactured were chlorine and caustic soda; but carbon tetrachloride was soon added, as the demand for this chemical rapidly increased. In 1918 caustic potash was first produced, and today the company is one of the country's largest sources for potash salts.

After taking the firm successfully through twenty years of almost constant growth, C. C. Speiden retired as active head in 1926, because of ill health, and became chairman of the board. During his administration, the plants at Jersey City, Murphysboro, Owego, and Niagara Falls were built, and many of the branch offices were established.

Mr. Speiden was succeeded by W. H. Sheffield, the present president, under whose leadership the company evolved into a well-departmentalized modern organization. It has grown until it finds itself in a position of triple importance, based on important domestic manufacturing facilities, excellent foreign connections, and numerous business alliances with large domestic producers. The present directors and officers are W. H. Sheffield, E. C. Speiden, C. L. Speiden, H. G. Mackelcan, C. C. Wickstead, G. S. Hamilton, T. G. Flavelle.

The company's line of products has continuously broadened and today includes over 250 industrial chemicals, without taking into consideration certain natural products which are more properly designated oils, waxes, gums, etc. To the standard line of liquid bleach, bleaching powder, and of caustic soda and caustic potash, in all forms, has recently been added liquid potassium carbonate, for the manufacture of which a special unit was built at Niagara Falls.

Active research laboratories are working on chemicals which cover a wide field of chemical activity—from chlorpicrin, a fumigant, to propionic acid for solvent use, from chemicals for dyestuffs to Ta-To-Lac, a form of lactic acid used in industrial baking. In applying iron chloride and chloride of lime to the problem of sewage disposal, Innis, Speiden and Company have not only done the chemical research but have developed the apparatus for applying. In carrying out researches which showed how to apply chlorpicrin to cereal products and soil fumigation, the company has diverted a war chemical to an important peace-time use.

Among recent improvements at Niagara Falls is the new power plant by which fuel costs have been cut to less than a quarter of the costs under the old installation.

In the latter part of 1934 another new company unit was added when the Jersey City plant was enlarged to take care of the grinding and refining of some of the oldest products on the company's list—the gums and waxes. Research had shown that various gums including gum arabic and a number of waxes, including Carnauba, montan, ozokerite, and ceresin, could all be improved as regards texture, color, and suitability for use in the arts. Another new development is amorphous silica, used as a paint pigment and in the polish trade.

Today the company, operating from its spacious and well-equipped offices at 117 Liberty Street, New York, with branch sales offices in Chicago, Boston, Cleveland, Philadelphia, Boston, and Gloversville, stands alert to discover new processes, and is applying for the benefit of its customers the experience of 119 years of serving American industry.

Here are shown: A Card Table with Bakelite Laminated Top; an Armature Winding with protective coating of Bakelite Varnish; a hand set Telephone of Bakelite Molded; a Denture formed from Luxene—a new Bakelite Resinoid; and a Yacht protected with a Bakelite Synthetic Resin Finish

Twenty-five years of "BAKELITE"

FOR many years chemists had struggled with the phenol-formaldehyde equation; but their net result was a growth of worthless materials, some of them soluble and fusible and resembling somewhat the known natural gums. Others were porous, useless masses. These unsuccessful resins, however, served as a starting point for Dr. L. H. Baekeland's years of systematic laboratory research—years of toil, disappointments, surprises, and chemical blind alleys. By the careful study of the illusive chemical reactions involved, Baekeland gradually succeeded in finding methods for controlling the action of phenol and formaldehyde under well defined conditions, and in 1909 announced his discovery to the American Chemical Society. He had produced a beautiful, hard, transparent material that looked very much like the best natural amber but was entirely different in properties and possible applications. Unlike amber, it was much harder, much stronger, and heat could not melt it, although high temperatures might char it.

Further experiments followed in rapid succession. Contrary to amber and other natural resins, this new material was unaffected by solvents and most chemicals. Baekeland discovered that he could produce an intermediary product, which was called Bakelite "A" and which was either liquid or solid and was still soluble, but which on further application of heat turned into a hard, strong, infusible and insoluble material. As some one put it, his liquid "A" "froze" when it was submitted to heat and could never again be melted. From this moment on he was able to divide the reaction into at least two phases, in the first one the product being either liquid or fusible, in which state it could be used for embrocation of coatings, or varnishes, or lacquers; but as soon as heat was applied under proper conditions the material "froze" to the hard, final, infusible condition. All applications of Bakelite Resinoid are based on those two successive reactions, the final state being called Bakelite "C". He thus produced a hardened material which could withstand water and organic solvents and was an excellent electrical insulator, besides being able to withstand temperatures at which former electrical insulators were destroyed or melted. Hence, its many applications in the electrical art. Then, filling the raw material while still in the "A" condition with fibrous fillers, molding materials of unusual strength and accuracy of molding were produced, which could withstand chemical and physical influences in a way until then unknown. Soon he counted as many as forty-three industries where his material could be used. It would be difficult to find forty-three today where it could not.

In 1910 Baekeland organized the General Bakelite Company. Like so many of America's successful organizations, its birth was humble and its growth was a normal, healthy one. New varieties of Bakelite Resinoids

were added, and new applications were discovered weekly; first in one industry and then in another. The news soon spread. People trekked to the company's office to find out what possibilities these new materials offered.

By the time the unfortunate incident at Sarajevo set the world on fire, Bakelite Resinoid had become an essential material in the manufacture of a wide range of products. The call to arms brought new demands.

There were insulation parts needed for electrical trucks, tractors and airplanes. There were control devices for battleships, destroyers, and sub-chasers. There were vital parts of radio and telephone equipment. There was insulation in the timing device for depth bombs. There were protective coatings for the lining of shells. There were control devices for submarines, and in all of these Bakelite materials played their important part in meeting the rigid requirements of the ordnance engineers and the manufacturers responsible for the production of these machines of war.

With the signing of the Armistice, the company immediately proceeded to put its house in order for peace-time activities, and to supply the normal needs of industry that had been so woefully neglected during the years of the great conflict.

In 1921 the Condensite Company of America, and the Redmanol Chemical Products Company, were consolidated with the General Bakelite Company to form the present Bakelite Corporation.

The pace of industry quickened. Automobile production stepped up. Radio caught the public fancy overnight—all of which resulted in increasing demands for Bakelite materials.

Being the result of chemical research, Bakelite Corporation fully realized the importance of constant vigilance, of changing trends and further inventions. The old Condensite Company's plant at Bloomfield, New Jersey, was reconditioned and new buildings added, and the entire plant was turned into a vast modern research center. Laboratory equipment of the latest type was installed. Separate departments were organized for the study of various problems, and manned by a staff of chemists, physicists, and engineers who were especially qualified by training and experience to carry on the scientific and engineering work at hand.

At the same time the corporation realized that in establishing a new industry, it should promote this industry with all the facilities available, and give its customers the benefit thereof. So it began a comprehensive marketing plan which has been largely responsible for the rapid growth of plastics in this country and throughout the world.

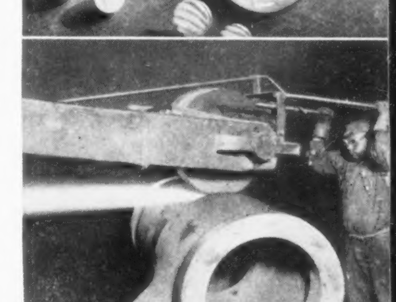
Through the cooperation of the Bakelite Corporation research laboratory and the engineering staff, with many of America's leading industrial concerns, there originated a long list of articles now in daily use, in almost every industry, profession, or walk of life.

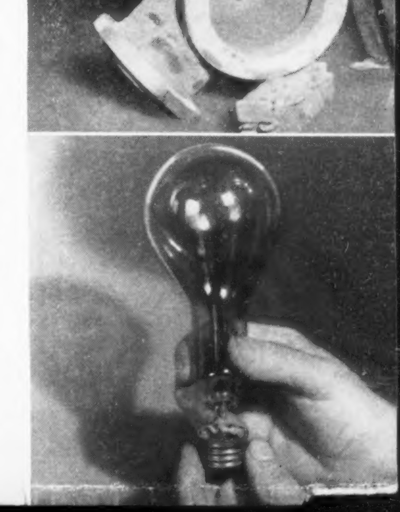
Distributor heads and timing gears for automobiles, telephone receivers, bottle caps and molded boxes, high-speed abrasive wheels, and dentures for holding artificial teeth, switchplates and plugs, coated waterproof fabrics, synthetic resins for paints and varnishes, cements for incandescent lamp bases, laminated materials for wainscoting and panelling, and bonds for plywoods and veneers. All of these Bakelite Corporation has either initiated or has helped manufacturers to develop into practical commercial articles of utility.

As a result of new markets, and the constantly increasing number of new materials, additions were necessary at the Perth Amboy plant, and the plant at Chicago was kept busy supplying the needs of the Middle West. Another plant at Toronto was established to meet the demands of the rapidly growing industries of Canada. Foreign affiliations followed in quick succession, first in Germany, then England, then Italy and France and Japan. So that from a small beginning, Bakelite Corporation became an international industry.

When the economic storm broke in 1929, Bakelite Corporation did not lose faith in the future of the country, and particularly in the future of the plastic industry. During the doldrum days of the early thirties, it consolidated its factory facilities in an entirely remodelled central plant at Bound Brook, New Jersey. It was completed about two years ago. Since then further additions have been made. Within the buildings of this factory are the culmination of a quarter of a century of experience in producing phenolic plastic materials. The number of varieties of Bakelite materials sold by Bakelite Corporation have increased now to over 2,000. And so the 25th Anniversary of "Bakelite" finds Bakelite Corporation thoroughly equipped and efficiently organized to meet the needs of industry in the period of rehabilitation that lies ahead.

Below we have a Revolite Raincoat, processed with a flexible Bakelite Resinoid; Jewelry Items fashioned from Bakelite Cast Resinoid; a Grinding Wheel bonded with Bakelite Resinoid; and a Lamp Bulb sealed to its metal base with Bakelite Cement.





Aromatics and Penetrants

When Van Dyk & Company was established in 1902, there came into being a chemical house which helped largely in making the American perfume manufacturer independent, even before the World War, of foreign sources for his aromatic chemicals. Starting with a few synthetic aromatics, the company pioneered in those early days in creating a list of native products. The company research, directed by Dr. S. Isermann, eagerly sought out new perfume chemicals, and gradually expanded the company's list. Throughout all this early work, and indeed through all the history of the company, Dr. Isermann has preached the self-sufficiency of all branches of the American organic chemical industry. At the start a great deal of such missionary work had to be done. The foreign manufacturers were well organized in the distribution of propaganda; and with them it was a patriotic as well as a commercial duty to force their chemicals into every possible foreign field.

Among the early perfume chemicals manufactured by Van Dyk were violets (ionone, etc.), rhodinol and its esters, citronellol (laevo and dextro, and their esters), nerol and its esters, acetophenone, aubepine, linalool, and a large number of rare alcohols, aldehydes, and ketones. A number of these are still outstanding company products.

As a pioneer American synthetic manufacturer, Van Dyk & Company faced skepticism as to the quality of American synthetics. Confident of the purity of his chemicals, however, Dr. Isermann's approach to his problem was to submit samples to manufacturers. He was willing to stand on the results of try-outs. And these experiments were generally favorable to Van Dyk chemists.

As part of the promotion work the company introduced into its selling program an early version of the blindfold test. When an unlabeled Van Dyk product was placed beside a foreign chemical, also stripped of the glamor of its label, and the buyer was asked to depend upon his sense of smell—the court of ultimate appeal for a perfume chemical—the native product was chosen gratifyingly often.

When the World War broke out, the company was in an extremely favorable position. It had a valuable background of scientific experience to help it. American manufacturers found already here a dependable, chemically sound source of the materials they could no longer get from abroad. The company promptly added to its research staff in order to learn how to supply any missing chemicals; but this was simply an expansion and not a new project. The methods of producing aromatic chemicals had been the company stock in trade for the previous twelve years.

In the early days the company confined itself to the manufacture of products used in perfumery. In recent years, however, with the enormous expansion of the cosmetic industry, Van Dyk has also entered the cosmetic-supply field. Among the chemicals added to the list were Cholesterol, Cetyl Alcohol, and similar products, all used in making skin creams and other cosmetics. Another recent product, developed by the company laboratories, is an ultra-violet absorbent used as a base for sunburn-preventive preparations.

In confirming the usefulness of an article developed by the research laboratories, the company makes a practice of calling in outside consultants to check up on physical and biological properties.

Now, as when the company began, one of the great company doctrines is the absolute equality of American chemicals with those produced abroad. This belief has been checked through the thirty-three years of the company's experience in supplying aromatics to the highly critical users of perfuming materials.

Another company under related management also has helped add to the list of native American chemicals. Synthetic Chemicals, Inc., of which Dr. Isermann is president, and J. W. Orelup is vice-president, were the first manufacturers in the United States of certain new types of wetting-out agents, emulsifiers, and supersoaps. The research on these products was largely carried on under Mr. Orelup.

One of the products, Tensol, a sulphonated product belonging to the ether type, possesses exceptionally powerful surface-tension properties which permit complete penetration of liquids into textile fibres. It is entirely different from a large class of mixtures or compounds, being distinguished by the fact that it acts in acid as well as in alkaline mediums. This allows its use directly in acid or neutral dyeing processes.

A patented product, Intramine, developed by Mr. Orelup, acts as a scouring, emulsifying, and cleansing agent. It has all the properties of soap to a degree heretofore unknown. Like Tensol, it acts in acid, alkaline, or neutral solutions. Lime, hard water, or metallic salts have no effect on its cleansing power. It is largely used in the textile industries and also in finishing hat felts, in the washing of delicate skins and hides, in the paper industry, in laundries and dry-cleaning establishments, and in processing fibres that are difficult to penetrate, like jute, sisal, and hemp. In a highly purified and concentrated form, it is available for shaving creams, dentifrices, and similar toilet products.

Further research is going on at the present time in the textile-chemical field and cosmetic field, and in other fields which can advantageously make use of similar chemicals. Application-research is also a part of the company program, in an effort to find wider and wider uses for the many products developed.

Chemicals from Brine

How Dow Research Developed into our Newest Industries

MIDLAND, the county seat of Midland County, is a mere speck on the map of Michigan, and until the late years of the nineteenth century was just another town which had mushroomed up on the banks of a stream to serve as a production center and supply base for the lumbering operations that were then the major industry of the State. There were, however, in the surrounding territory, deposits of other raw materials in the form of native brines, originally tapped by the operators of the lumber mills as a source of salt, in the production of which the sawmill wastes could be used as fuel with by-product economy. These brines had long been of great interest to Herbert H. Dow, a young graduate from Case School of Applied Science; and as the direct result of his original research and his faith in the wider-spread commercial possibilities of his raw material, Mr. Dow, in 1890, founded at Midland the institution which is now The Dow Chemical Company.

From the very beginning Mr. Dow, not content with separating and finishing into marketable form the several native components of the brine, and being by nature a scientific adventurer, made further research one of his chief interests, and set aside a substantial portion of the income from his established processes for the furtherance of development.

The Dow Chemical Company has followed this definite policy of its founder throughout its history, and as a result has been successful in developing not only a large number of new products, but improvements and economies in its earlier and more elemental processes as well. One of the company's early accomplishments was the development of an original process for the production of bromine by the electrolysis of native brine. Bromine is an important basic material largely used in the manufacture of photographic and medicinal chemicals, and this new process not only produced a purer bromine but made it possible to supply finished bromides to the American consumer at a lower cost than had hitherto been possible. Previous to this time European manufacturers had dominated the fine chemical markets of the world; and this low-cost production of bromine and bromides at Midland was the first serious American challenge to the European chemical industry.

The basic principles of the Dow electrolytic bromine cell were early adapted to the production of chlorine,

Air view of the Dow Chemical Company, Midland, Michigan. This largest single chemical plant covers an area of 250 acres and employs 3,000 men.

Captain A. W. Stevens, Major William E. Kepner, Captain Orville A. Anderson of the U. S. Army, with the Dowmetal gondola in which they made a successful stratosphere flight for the National Geographic Society in 1934. A similar gondola is being built for the 1935 flight.

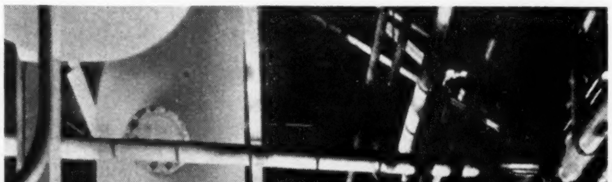
from which were made such products as bleaching powder (chlorinated lime), sulphur chloride, carbon tetrachloride, and other chlorinated products. The manufacture of chloroform from carbon tetrachloride by an unique and original process which—while extremely simple in principle—produced an exceptionally pure grade of finished product, was begun within a comparatively few years.

Previous to the United States' declaration of war in April, 1917, the company had been supplying the Allied governments with large quantities of bromine, phenol, caustic soda, dichlorbenzene, and other raw materials necessary to the large-scale production of munitions. When the United States entered the conflict, the company's preparedness proved itself in the decision of the government to establish in Midland a branch of the Edgewood Arsenal, as a result of which many additional wells were drilled to secure the larger supply of brine necessary for the phenomenally increased demand for both bromine and chlorine brought about by the hitherto unthought-of use of these gases as munitions of war. Dow research evolved processes for the preparation of mustard gas from ethylene and sulphur chloride, and this plant was the first to produce this product on a large scale in America.

In addition to production of munition raw materials, and because of the effectiveness of the English blockade in preventing the shipment of dyes from Germany, a crisis in the domestic textile industry was averted by the development of the first American plant for the manufacture of synthetic indigo. Indigo paste was first marketed by The Dow Chemical Company in 1916, followed by various derivatives in the form of brominated indigos, both through the company's original research and the licensed manufacture of previously developed dyes heretofore produced only in Europe.

Following the war the company, in common with every other American business which had been so unnaturally expanded, went through a trying period of readjustment in accommodating itself to the altered demands of industry on a peace-time basis. With the improvement of general industrial conditions Dow found itself, due to its uninterrupted adherence to a vigorous program of research, well prepared to meet the demands of a radically changed market arising from the war-time established independence of foreign products. The most important large-scale development of this transition period was the improved process for the manufacture of calcium chloride. Dow developed a flake form of this chemical and learned how to use it both as a dust palliative for gravel highways and as a curing agent in concrete construction. At the same time a pure form of magnesium chloride was perfected and manufactured in large quantities for use in certain branches of the building industry.

The company's war activities alone did not monopolize the time and interest of its research staff, which had engaged itself in the synthesis of coal-tar medicinals, particularly the salicylates; and again successful completion of its experiments into commercial-scale production assumed enormous importance with the shutting off of importations from the foreign monopoly. From that period this line has been enlarged gradually until it now includes raw materials for the soap, dye, and perfume industries.

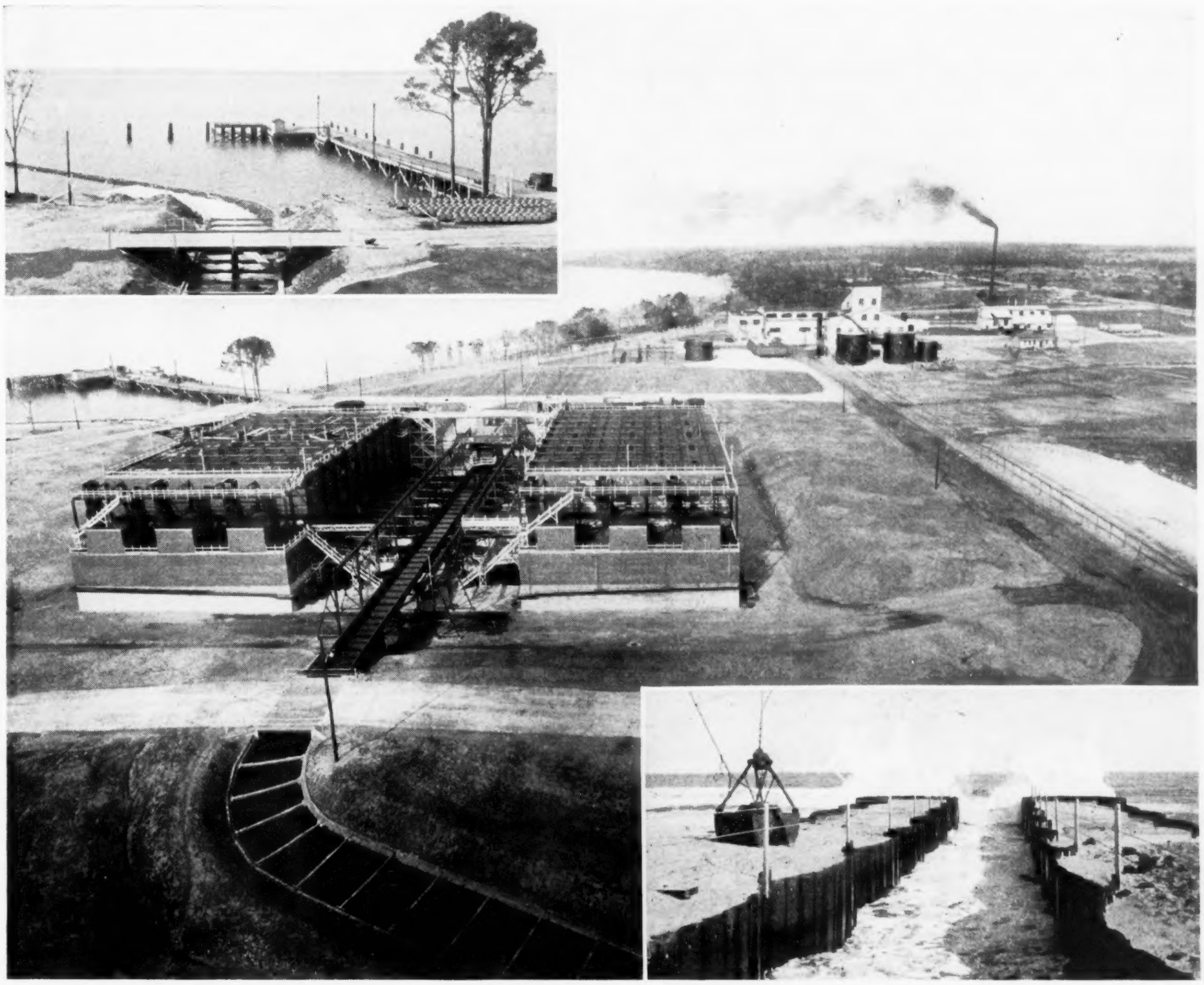


A typical Dow production plant.

Phenol, manufactured during the war by an old and comparatively crude method, became in the decade immediately following of major importance because of advances in the plastic resins industry. To meet the situation thus created, as well as to furnish one of its own important raw materials, the company perfected an entirely new process and, in 1922, erected and placed in operation the largest phenol plant in the world.

Coincident with this development and due to the phenomenal growth of the cellulose acetate, rayon, and non-inflammable film industries, a process for the synthesis of acetic anhydride from sulphur chloride and were concerned. In the manufacture of synthetic indigo, aniline oil, one of the most important ingredients, had always been purchased by necessity from earlier established producers but with the continued branching out of the company's activities in the field of coal-tar products, the production of this commodity by an original process developed by the organic research staff placed Dow in the position of being able to supply not only its own needs but those of industry as well, with an aniline oil superior in quality to anything which had been previously available.

Dating back well into the war-time era and with the



The Ethyl-Dow bromine plant on a neck of land between the ocean (see the intake for sea water in the lower right hand corner) and the Cape Fear River (see the outlet of the water and the company dock, upper left hand corner), producing 15,000 lbs. of bromine daily from 37,000,000 gallons of ocean.

sodium acetate was perfected. At the same time the rayon industry alone made necessary the material enlarging of the company's facilities for the manufacture of carbon bisulphide, the major use of which previously had been as an intermediate in the manufacture of carbon tetrachloride and as a solvent in the rubber industry.

Another of the basic ideas of the early Dow organization was to see itself as nearly as possible in a self-sufficient position as far as its partly processed raw materials knowledge of a supply of magnesium chloride as inexhaustible as the brine supply itself, experiments in the evolving of metallic magnesium had been in process. In the year 1918 these experiments began to bear fruit when Dow pioneered the magnesium industry in this country by placing in operation an efficient electrolytic plant for the production of this metal.

Magnesium, in common with other light metals, is relatively soft and does not possess the necessary strength and allied properties which render it fit for

general structural uses; but extended research to determine the proper alloys has resulted in a line of products marketed under the group name of "Dowmetal" which possess not only the required strength but the characteristic extreme lightness of the metal itself. Less than one-fourth as heavy as steel and approximately two-thirds as heavy as aluminum, these Dowmetal alloys are becoming of increasing importance in the manufacture of aircraft parts, portable tools, in automatic high-speed machinery and for truck, trailer, and bus construction.

During recent years the growing popularity of ethyl gasoline has required increasing quantities of bromine, the production of which from the Midland brine field presented the serious problems of disposing of the remaining brine constituents. For a long time it has been recognized that the ocean holds an inexhaustible supply of this element; but no method was available which could reclaim with economy the one pound of bromine known to be contained in every two thousand gallons of sea water, until one was evolved by Dow research. Finally, in conjunction with the Ethyl Gasoline Corporation, the Ethyl-Dow Chemical Company plant near Wilmington, North Carolina, was completed in 1933 and now processes by this method approximately twenty-six thousand gallons of sea water per minute, producing the additional bromine necessary for the manufacture of ethylene dibromide, one of the ingredients of ethyl fluid.

In the operation of its brine wells, Dow has been faced at times with the problem of decreased flow, through the obstruction by natural causes of the pores of the limestone formation in which these wells are drilled. To overcome this difficulty, the company perfected a process based on the reaction of dilute hydrochloric acid on limestone. The results were so successful that, with the discovery of oil in Central Michigan, the process was adapted to the treatment of oil wells with equally gratifying efficiency. It was necessary, however, to preserve the mechanical structure of the treated wells by overcoming, as nearly as possible, the corrosive action of the dilute acid on the metal-well tubing. This was accomplished by the addition of certain inhibiting chemicals produced within the Dow plant as by-products of other manufacturing operations. Now the use of this process, through the activities of one of the company's subsidiaries, Dowell Incorporated, has extended beyond the limits of the Michigan field and assumed a national scope, resulting in the treatment of more than four thousand wells in the last three years, with an average increase in oil production per well of four hundred per cent. or more, and a total value of oil thus produced amounting to millions of dollars. Through this work the company has been instrumental in increasing the recovery of a previously inaccessible portion of one of the nation's most important natural resources.

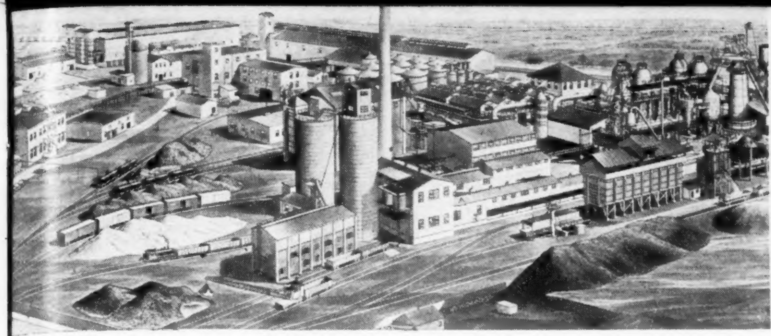
Previous reference has been made to calcium chloride and its manufacture in the more easily handled flake form and its subsequent application to gravel road surfaces where, through its property of absorbing moisture from the atmosphere, it performs a genuine service in laying dust and consequent preservation of the road structure. More recently Dow technicians have combined calcium chloride flake with inexpensive locally available soil materials into a stabilized and firmly bound highway surface. The low cost of this pavement-like structure has made the construction of many more miles of serviceable secondary highways possible.

Until very recent years the nation's requirements of iodine have all been imported; and in line with the industry's desire for independence from foreign sources, numerous unsuccessful attempts were made to secure an adequate supply of this element on a commercially economic basis from various native sources of the crude product. Certain brines in the country, particularly those found in the West, contain small percentages of iodine but it was not until a particularly adapted extraction method was developed by the Dow organization similar to the "Bromine-from-the-sea-water" process that commercial extraction of iodine in this country became possible. In its plant at Long Beach, California, another subsidiary, the Io-Dow Chemical Company now produces out of the waste brine from petroleum wells a substantial part of the nation's iodine consumption.

No attempt has been made to enumerate separately the more than two hundred related Dow products, only those of major importance being treated in the foregoing paragraphs; but in recent years a group of comparatively small tonnage items have been developed for specialized uses. Among them is a line of phenolic derivatives known as Dowicides and which possess excellent fungicidal and germicidal properties for use in the control of bovine tuberculosis, the preservation of glue, and the control of moulds and stains in the manufacture of wood products.

Important departures from previous methods include processes for the manufacture of improved physical forms of various products which, in their older forms, have been made by the company previously. These include sodium sulphide, caustic soda, and sodium acetate, the latter important as a source of acetic anhydride and, consequently, of material importance in the rayon industry.

The Dow Chemical Company's research staffs continue their work on problems both new and old, always endeavoring to effect economies and improvements in old processes, to develop new methods and products. Such has been the background of the company from the beginning and with its unabated desire to grow and enlarge its service to industry as a whole, it is safe to assume that the many scientific contributions already made to the progress of domestic chemical manufacture can be considered but a prelude to even greater accomplishments in the future. To the soundness of this prophecy, the constantly increasing number of developments as the years have progressed bear witness.



Phosphate Salts

THIRTY-THREE years of continued progress under the same management is the record of the Victor Chemical Works. It was the president of this company, August Kochs, who in 1902 was the founder when he began operations in a small plant at Chicago Heights with a few laborers and two chemists. A year later Walter B. Brown joined Mr. Kochs as chief chemist, later becoming plant superintendent, and then vice-president. The sales manager, O. H. Raschke, joined the company twenty-one years ago. Others were added to the staff from time to time and almost every key man has been with the company from ten to twenty years.

The first plant was designed, and the company's aim was to produce a monocalcium phosphate for baking powder purposes superior in purity to any phosphate then on the market. Little progress had been made in that respect for many years, and the phosphate of commerce was rather crude, not very stable in baking preparations, and of low strength.

Applying knowledge gained in the laboratory, free phosphoric acid was eliminated and the purity of the product was improved, with a result that the greater stability of baking preparations increased the field of usefulness of monocalcium phosphate. Up to 1914 all edible phosphate had been made from bone. After several years of research, however, the company developed a method of utilizing rock phosphate which yielded a purer and more stable phosphate.

Along with the development of pure monocalcium phosphate came the production of technical and food grade phosphoric acid. This acid thus became an industrial raw material where the high price of syrupy acid had previously prevented its use.

To diversify its manufacturing activities, the company early began the manufacture of U.S.P. Epsom salt, using magnesite from Greece.

With the war came the demand for organic chemicals. This resulted in the manufacture of synthetic oxalic and formic acids. Some oxalic acid had been manufactured in this country from sawdust and a little formic acid made from imported sodium formate; but the bulk of these acids had always been imported. By grace of the license control of imports of organic chemicals and the subsequent passage of the Tariff Act of 1922, containing the flexible tariff provision, the production of oxalic acid has been continued without interruption, and an acid surpassing the old standards of purity has been available domestically.

The Tariff Act of 1922 failed, however, to protect the formic acid industry from the flood of low cost German acid, and within sixty days of the removal of license control, its manufacture had to be abandoned. Not until 1928 was it possible to re-establish this industry in the United States, and again, Victor was the pioneer.

In 1920, Victor Chemical Works erected a second plant at Nashville, Tenn. This represented, at the time, the last word in design for the production of phosphatic salts and phosphoric acid. However, in 1923, a major research program was begun, the results of which have commanded world-wide approbation. A small blast furnace, designed to smelt phosphate rock and volatilize the phosphorus, was built at Chicago Heights. In the face of difficulties that at times seemed insurmountable, and freely proffered predictions that the process was impossible to operate, the work continued. After four grueling years, the experimental furnace was made to operate successfully.

This was the first successful application of a fuel-fired furnace for the volatilization of phosphorus and the production of phosphoric acid. A commercial furnace was erected at Nashville, and was blown-in in February, 1929. Later the furnace was enlarged to supply the entire phosphoric acid requirements of the company and the old wet processes discarded. Beside phosphoric acid, this furnace produced yellow phosphorus and by-product ferrophosphorus. The production of triple superphosphate at Nashville is the first commercial use of volatilized phosphoric acid in the manufacture of fertilizer materials in the country.

During the past twenty years, diversification of the company's activities has been steadily pursued. A complete line of phosphatic salts for technical and food purposes has been added. Special dentifrice grades of di- and tricalcium phosphate, approved by the American Dental Association; pyrophosphoric acid, a readily soluble form of sodium metaphosphate; derivatives of formic and oxalic acids; water-proofing agents; fireproofing materials; a light weight concrete aggregate from slag; phosphoric anhydride as an industrial chemical; phosphorous compounds; inhibitors; and rustproofing compounds are among recent accomplishments of the Victor organization.

The progress of the company has been steady through the development of the quality and diversity of its products, and has been made without mergers or purchases of other companies.

Plant of Victor Chemical Works at Chicago Heights, Ill. Above, plant at Nashville, Tenn.

Permanganate

and the Carus Chemical Company

STARTING back in 1915, Dr. E. H. Carus first experimented with the possibilities of producing potassium permanganate. Unforeseen and unexplainable difficulties were encountered from the start. Reactions did not terminate as expected. Raw materials from different sources reacted differently although of the same analysis; and temperatures, dilutions, concentrations, etc., had to be worked out to suit each. After several years of experimentation (1917) the first semi-commercial plant for the manufacture of potassium permanganate was erected. At that time an efficient process was not known in this country; and although potassium permanganate sold upwards of $2 per pound, the Carus Chemical Company and the other twenty-six American makers could not operate efficiently. This was evidenced at the end of the World War when the price of potassium permanganate dropped to 50 cents per pound and all American makers, excepting the Carus Chemical Company, discontinued the manufacture.

Due to the perseverance of Dr. Carus and his associates, who have practically lived with the business since 1917, and due also to continual research work and experimentation, in 1929 the Carus Chemical Company was able to produce efficiently potassium permanganate, with reasonable duty protection, in competition with German and other European manufacturers. After 16 years of research starting from a one-room shack to the present plant occupying more than a square block and housing special units of unique design, potassium permanganate is being produced in America in commercial, U. S. P., and special granulations to meet the requirements of the various American industries.

Potassium permanganate, being a very powerful oxidizing agent, has many uses. It is regularly used in chemical industries for purifying various chemicals such as zinc solutions and various organic and inorganic compounds. Its purifying action is aided by the strong "adsorptive" properties of the freshly precipitated manganese, which acts as decolorizer and deodorizer and therefore aids in purification. No doubt additional uses for various purifications will be found in the future. Municipal water-works have used it in treatment of municipal waters for removing chlorophenol tastes and odors. One of the principal uses of potassium permanganate during the World War was for the production of saccharine. Since then, however, bichromate has replaced potassium permanganate, and new uses for potassium permanganate must be found to compensate for this loss and enable the plant to operate efficiently. This is at present one of the major sales problems—the development of new uses for potassium permanganate. To compensate the loss partially, Carus regularly revert large quantities of potassium permanganate to the benzoic department for the manufacture of benzoic acid.

It is interesting to note that in this country the per capita consumption of potassium permanganate is much less than in Germany. There it is used by every household for a deodorant, antiseptic, etc. Perhaps one of the principal reasons for this widespread use of this material in Germany is the fact that young men in the army are given potassium permanganate and taught its merits, how to use it for first aid, as an antiseptic and deodorant, etc. Why should not Americans use more of this economical and efficient antiseptic in their homes?

During the past years, in an effort to maintain production of potassium permanganate at such figures as will allow efficient operation, research has been carried on for the manufacture of the rarer permanganates such as zinc, calcium, sodium, barium, magnesium, strontium, etc. Processes have now been developed for the manufacture of these various permanganates, but the market for them is very limited at present. One of the principal new uses is for the aging of liquor (a patented use); another is in a secret formula. Both of these, however, do not total a sufficient volume to permit installing the special units necessary for production on an economical basis. These rarer permanganates are at present being imported from Europe at prices ranging from $2 and upward per pound. With a reasonable commercial consumption in this country, these items can be produced at prices of around $1 per pound.

The use of the rarer permanganates presents a wide, fertile field of unknown virtues to the American chemist. Cooperation will be gladly given to anyone to develop possible new uses, with full protection to the inventor.

In addition to the manufacture of potassium permanganate, the Carus Chemical Company is regularly producing a heavy, quick-settling precipitated dioxide having the property of removing heavy metals from water. Waters heavy in copper, when heated with this dioxide, are freed of the metal. Other products are pure benzoic acid and sodium benzoate; manganese sulfate in anhydrous, hydrous, fertilizer, and technical grades; artificial precipitated manganese dioxide; quinhydrone and hydroquinone. Quinhydrone also presents a fertile field to the chemist to develop new commercial uses, as it is now available at a low price in a technical grade.

The 20 Mule Team Made Death Valley Famous

and Gave Borax Its Start as one of Industry's Most Widely Used Chemicals

MEN first crossed Death Valley in search of gold and a short-cut to California. But borax, not gold, proved the treasure of this strange and colorful desert land.

The discovery of borate deposits and their development by the Pacific Coast Borax Company played an important part in the history of the Old West. For 20 years the famous 20 Mule Teams thundered through Death Valley's twisted canyons, carrying the precious borax to the nearest railroad, 167 miles away. Then new borate deposits were discovered in the mountains surrounding Death Valley.

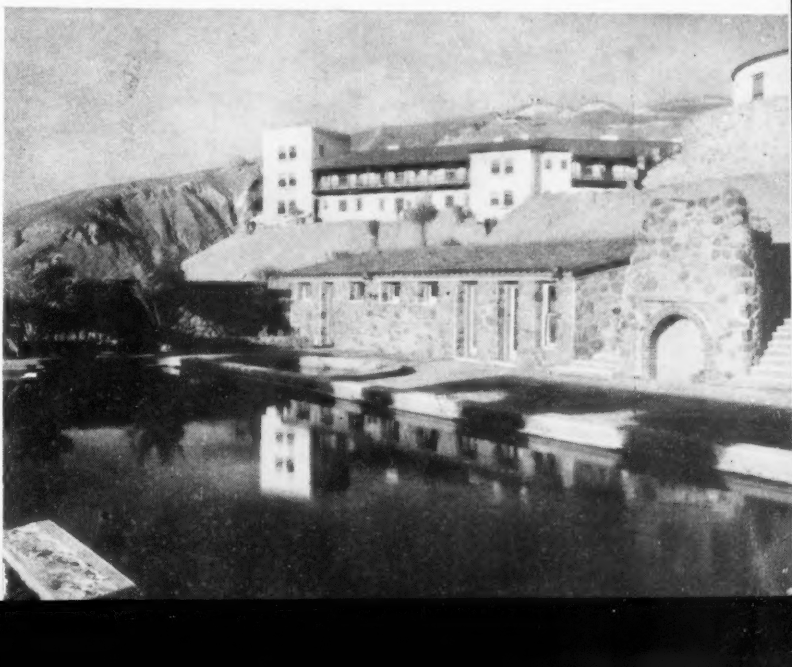
Today the discovery of a new mineral has moved borax activities from Death Valley to the Mojave Desert. This mineral has been called "Rasorite," after C. M. Rasor, mining engineer of the Pacific Coast Borax Company. Rasorite is a crystalline hydrate of borax never known to exist prior to the discovery of these deposits. It is found at a considerable depth below the surface and is associated with crude borax, tincal, and with strata of shale and clay. The accessibility and workability of these new deposits have already brought about economies in the mining and processing that are to a large extent responsible for the reduction of the price of borax and boric acid. Due to this lower price many are seeking to take advantage of the unique properties of borax and boric acid in new lines of manufacture.

In the modern home the brilliant, white-enameled basins, sinks and bath tubs, the colored table tops, stove parts, and enameled utensils owe their attractive surfaces to borax and boric acid. Most enamels contain a considerable proportion of borax. In fact, the modern enamel industry could hardly have reached its present development without the large-scale production of borax and its availability at a low price.

In metal-working, borax is used as a flux.

Boric acid is used in pottery glazes, boric oxide in the manufacturing of glass and in making special heat-resisting and optical glasses. In the production of leather both borax and boric acid are used. The textile industry uses borax for degumming or "boiling off" silk. Borax can be used to advantage in making glue and mucilage. It is also a solvent for dextrine and casein and is at the same time non-corrosive. It is used in hairwaving, electro-plating, manufacturing insect repellants, soap-making, mold prevention, industrial cleaning, and a host of other ways.

The borax industry is still expanding and it will continue to grow with the demand for its products. It is an industry producing materials essential to many other industries. Its future is, therefore, closely tied up with the progress of the consuming industries, and with the development of new outlets.



Today you can travel by motor over the trails the 20 Mule Teams followed and stop at Furnace Creek Inn for a perfect winter vacation with golf, tennis, riding, swimming . . . and scenic thrills galore. For Death Valley has been made a National Monument and is fast winning new fame as a popular winter resort.

Mathieson—Pioneer Producer of Bleach and Alkali

FROM an historical standpoint, Mathieson's forty years of active existence may seem to be relatively brief in comparison to that of the American chemical industry as a whole. Yet in its own field—the manufacture of bleach and alkali—Mathieson stands forth as a pioneer American producer.

At the time The Mathieson Alkali Works was incorporated in 1892, all of the bleach and most of the alkali consumed in this country was still being imported from England. In fact, so strong was the then existing prejudice in favor of the imported products that the launching of domestic production was a pioneer venture both as to manufacture and as to marketing. Under these circumstances, it may or may not be of historical significance that Mathieson's first production was begun on the Fourth of July, 1895!

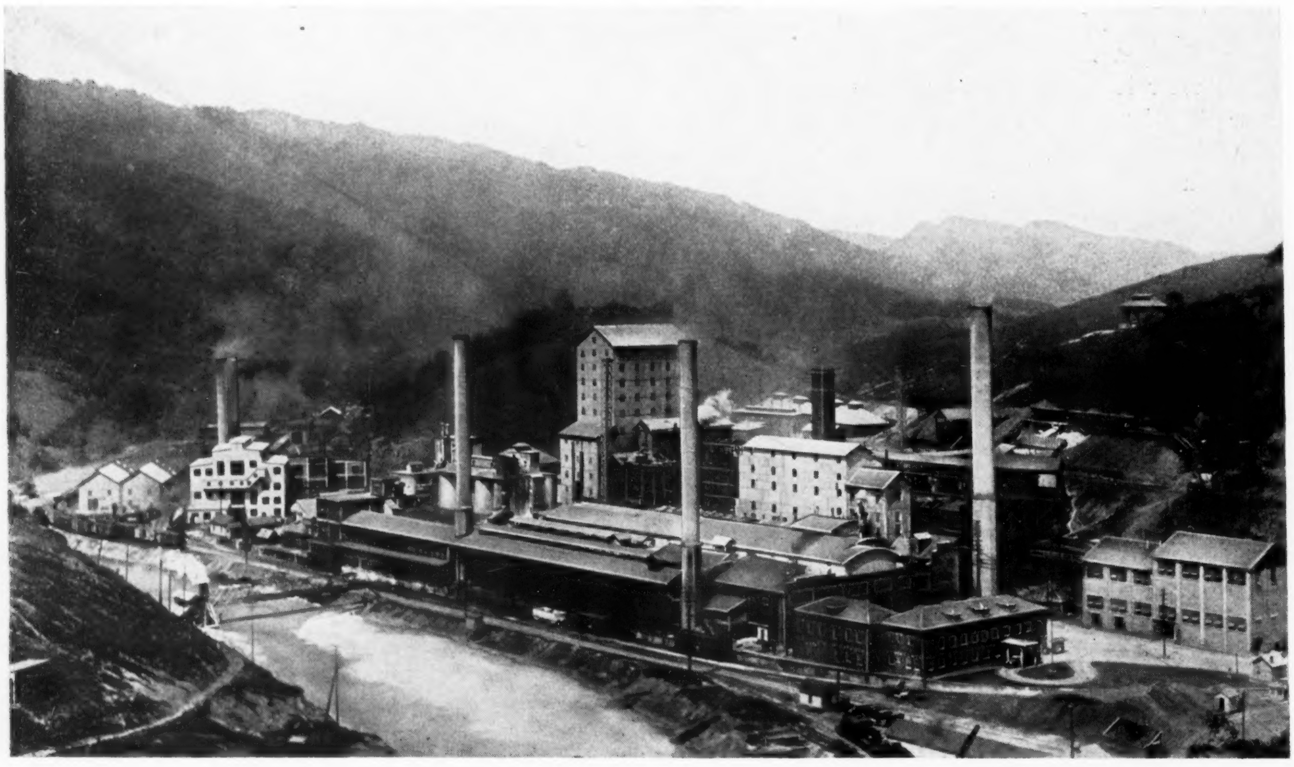
Since ordinary salt is the starting point in the manufacture of both alkali and bleach, the site selected for the first Mathieson plant was Saltville, Virginia, where huge salt deposits were available as the company's chief raw material. Although it was not until 1893 that these salt properties were acquired by The Mathieson Alkali Works, their history dates back to pre-Revolutionary days when Indians and early settlers came from far and wide for their precious supplies of salt. During the stirring days of '61-'65, Saltville was the only accessible salt supply in the South, and, as such, became a focal point of conflict between the warring forces. Even today signs of the breastworks thrown up by Confederate soldiers are still to be seen in the neighborhood of the present alkali plant.

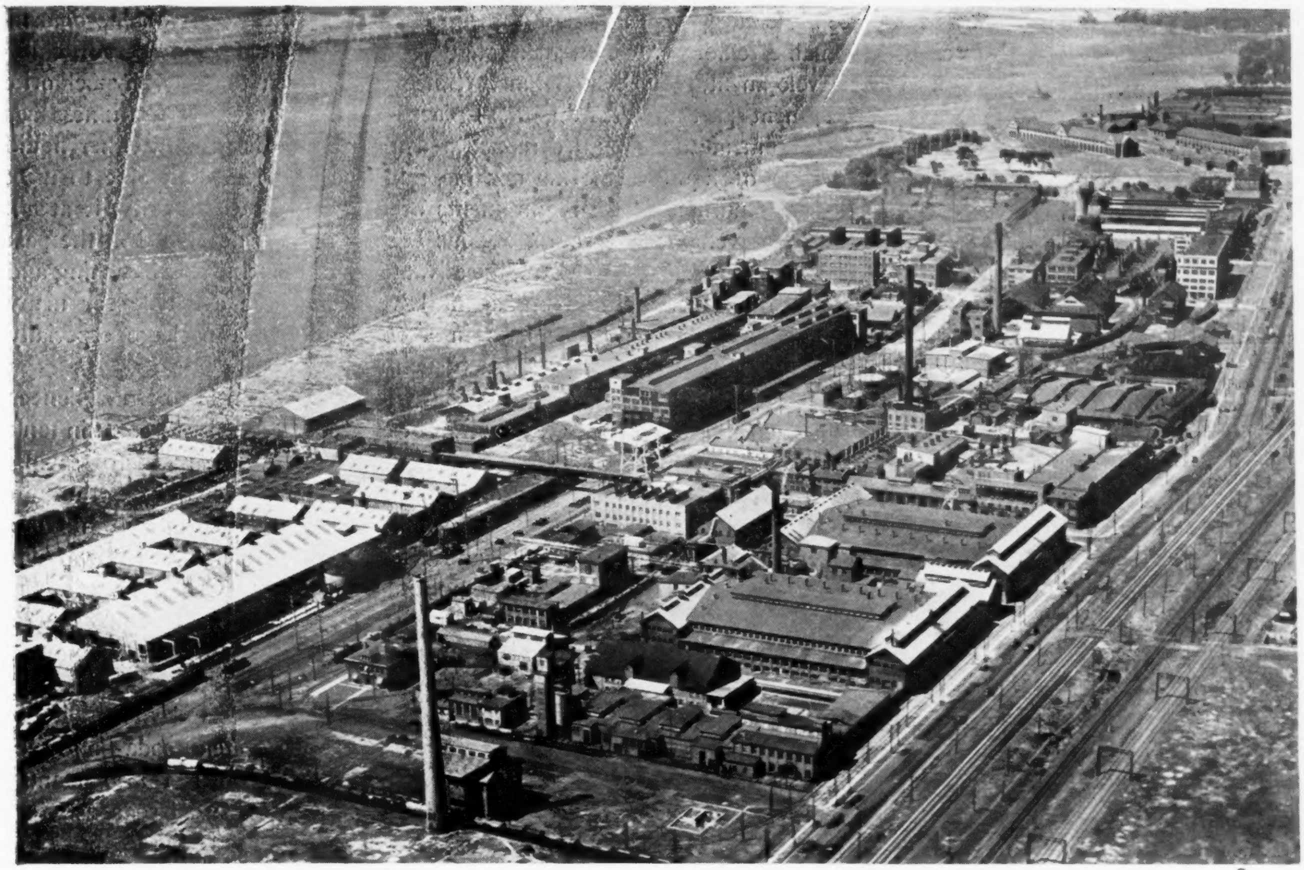
Fortunately for the early success of the company's operations, the construction of the Saltville plant was directed by Thomas T. Mathieson, whose experience in manufacturing alkali products in England with the Neil Mathieson Company proved to be invaluable. Another outstanding pioneer in the company's early history was James H. MacMahon, who, while an American by birth, had spent his early life in England and was closely associated with H. Y. Castner. When Mathieson secured control, in this country, of the Castner electrolytic cell for the manufacture of caustic soda and chlorine, Mr. MacMahon came over to take charge of these new operations.

A small unit of the Castner cell was first installed at Saltville in order to demonstrate the efficiency of the

At Saltville, Va., Mathieson's original ammonia-soda plant began operations just forty years ago—the first alkali plant south of the Mason and Dixon Line. The present Saltville plant, shown below, is far greater in size and capacity, but it still occupies approximately the same location.

During the War Between the States, the deposits at Saltville were the only accessible supply of salt in the South. Now, however, salt is obtained here exclusively as a raw material for the huge Mathieson plant. Soda ash, caustic soda, bicarbonate of soda, and various fused alkalies such as Purite (used by foundries) and PH-Plus (used for water softening) are made at Saltville.





Mathieson's plant at Niagara Falls, N. Y., is shown in the foreground of this aerial view. Extending for blocks along Buffalo Avenue, it occupies a prominent place among the industrial developments attracted to this location by low-cost electric power. The Falls themselves are only a short distance below the plant, just beyond the background of this photograph.

At this location, Mathieson built the first commercial plant in America for the manufacture of chlorine and caustic soda by an electrolytic process, and these two products are produced here in large quantities today. Mathieson's other chlorine products—bleaching powder, C C H, H T H and H T H-15—are also produced at this plant. In addition, large quantities of ammonia are made here "from the air at Niagara."

process. While this unit showed the feasibility of using an electrolytic cell, it also demonstrated the necessity of cheap power. The plant at Saltville was, therefore, dismantled, and a larger unit was erected at Niagara Falls under the name of the Castner Electrolytic Alkali Company. It was here, at the end of 1896, that Mathieson began the first commercial production of bleaching powder in the United States.

Steady expansion and improvement of facilities at both Saltville and Niagara Falls marked the succeeding score of years. When the nation suddenly found itself confronted by the World War, the need for chemicals of every kind became acute. Increased production of alkali and chlorine for war purposes was essential, and Mathieson, together with other producers, bent every effort towards this goal, functioning almost exclusively on war supplies. Thus the close of military operations found the seriously overtaxed plants in bad condition physically, while former customers were to a large extent scattered and lost.

It was at this critical point in the company's history, with a complete financial reorganization necessary, that Edwin M. Allen was asked to assume the presidency, in July, 1919, and to undertake the task of restoring the prestige and leadership of Mathieson in the field of alkali and bleach. How well he has succeeded is a matter of record. His life-long friend, George Ade, on the occasion of seconding Mr. Allen's nomination for the CHEMICAL MARKETS Medal as the outstanding chemical industrialist, said ". . . he has achieved that success because he has been wise, thorough, far-seeing and keen intellectually. The figures for The Mathieson Company under his presidency tell their own story."

The period since the war and the reorganization under Mr. Allen's leadership has been one of steady progress and expansion in the company's facilities and in the pioneering of new products, new engineering developments and new selling policies. It will be recalled that alkali and bleach, up until shortly after the war, were marketed almost entirely through the medium of exclusive selling agents. In other words, the manufacturer was solely a producing organization and had no direct contact with the consumers of his products. One of the first moves made by Mr. Allen was the establishment of the company's own selling organization and the pioneering of the policy—since adopted by all other major producers of heavy chemicals—of selling *directly* to the consumer.

Just prior to the war the production of liquefied chlorine gas had become a commercial reality, and liquid

chlorine had begun gradually to displace bleaching powder as an industrial source of available chlorine. Mathieson was in the forefront in this development, and company engineers have played a prominent part in designing containers, valves, and other equipment that have rendered the shipment and application of liquid chlorine safe and economical. The well-known multiple-unit chlorine gas tank car was designed and developed by Mathieson engineers, and the long fight to secure its full rating as a tank car by the carriers was undertaken and financed by Mathieson to a successful conclusion before the use of the new car was thrown open to the rest of the industry.

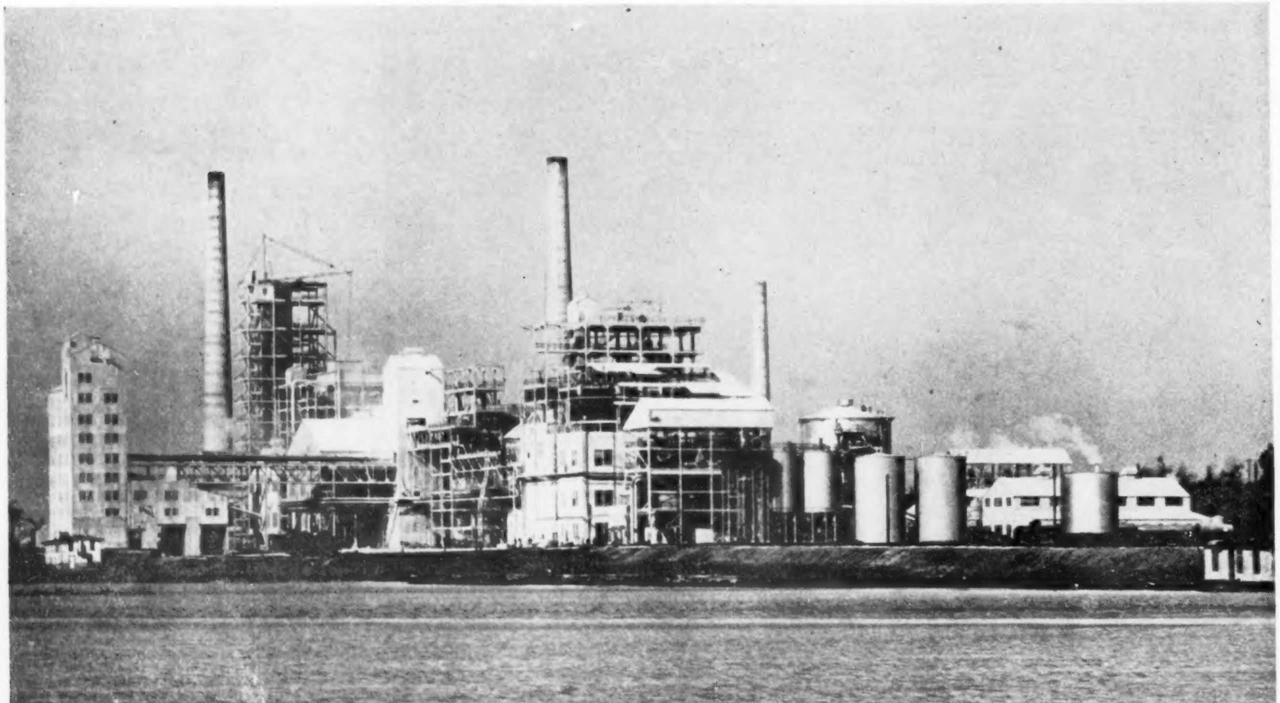
In 1923 Mathieson launched another pioneering venture by installing a small synthetic ammonia plant at Niagara Falls which took nitrogen from the air and combined it with waste hydrogen gas from the electrolytic alkali process. Prior to this time the commercial production of ammonia was from by-product ammoniacal liquor, and the cost to the consumer was relatively high. The new Mathieson synthetic product was of so much greater purity and the production cost so much lower that other producers were quickly forced to fall in line, both as to selling prices and method of production. Today, practically all ammonia on the market, both anhydrous and aqua, is made synthetically, with Mathieson as one of the outstanding producers.

Meanwhile the company's research laboratories at Niagara Falls had been engaged in the development of an entirely new chlorine-carrier, a true calcium hypochlorite in the form of a dry, stable, and readily-soluble powder testing more than twice the available chlorine concentration of ordinary bleaching powder or chlorinated lime. Since 1928, when this new hypochlorite (HTH) was placed on the market, its usefulness has been demonstrated in many fields where neither liquid chlorine nor bleaching powder had been able to meet the requirements of consumers satisfactorily, if at all. Through various HTH products developed in the past few years, the advantages of chlorine as a bleaching and sterilizing agent have been made available for many specific uses in a form and in a package especially adapted to each such use.

Another field in which Mathieson has been a pioneer is the distribution of caustic soda in liquid form in tank cars, a development that has been the means of saving many thousands of dollars to large consumers through lower transportation and handling costs. Both from the Saltville and Niagara Falls plants, and now from the recently completed plant at Lake Charles, Louisiana, Mathieson has been instrumental in effecting these economies for many of the nation's most prominent industries.

At Saltville, in addition to the standard alkalies—caustic soda, soda ash, and bicarbonate of soda—a group of fused alkalies in briquet form are also manufactured. These include Purite, a fused soda ash for metallurgical use; MaFoS, a super-sodium phosphate in slow-dissolving briquets and tablets for use in dishwashing machines; and PH-Plus, a fused alkali briquet for water treatment and pH control. Another recent Saltville product is solid carbon dioxide or dry ice,

The towers, stacks and steel-work of the Lake Charles Plant, confusing as they appear to laymen, impress production engineers by their advanced design, integrated operating facilities, and unique arrangements that reduce handling costs. Many refinements that help to insure products of exceptional uniformity and purity are also incorporated in this modern plant.



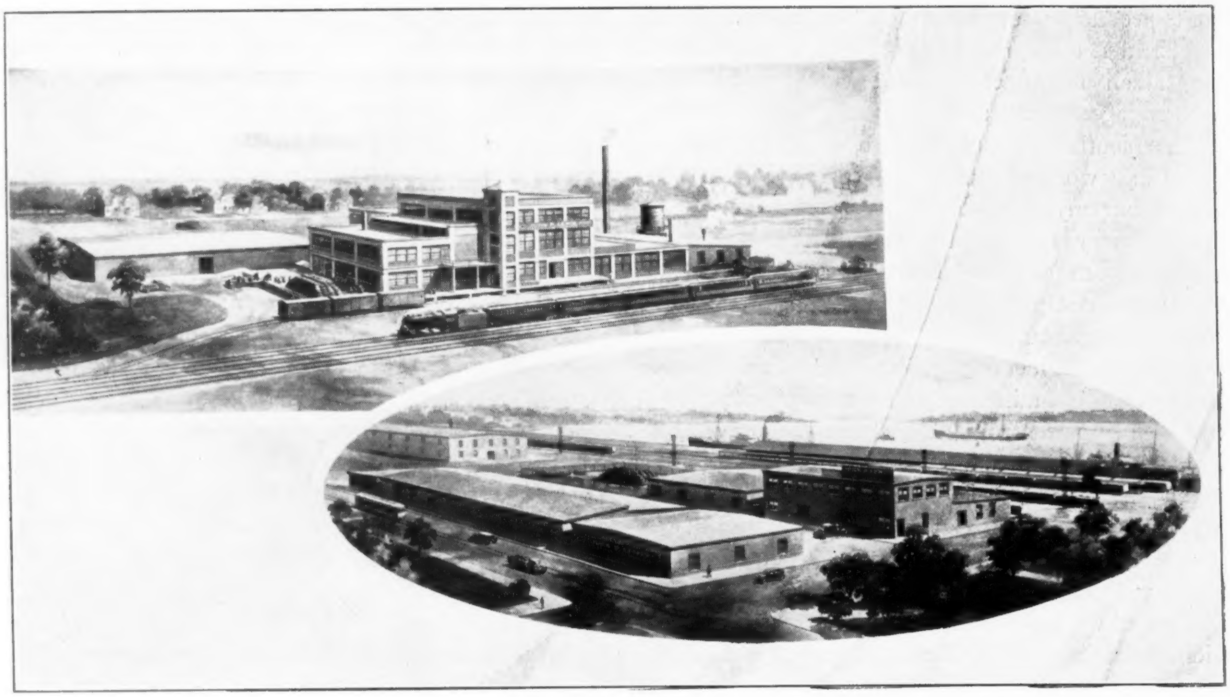
which is produced from highly purified carbon dioxide gas obtained as a by-product of the ammonia-soda process of alkali manufacture. The company has also become engaged in the marketing of gypsum products in certain southern states through acquisition of the property and works formerly owned by the Southern Gypsum Company at North Holston, Virginia.

On February first of the present year, the new Mathieson plant at Lake Charles, Louisiana, began making regular shipments of alkali to consumers in the rapidly-growing Southwest. This new plant embodies many unique engineering developments that reduce handling costs to a minimum and permit an exceptional degree of quality control over the manufacturing process. Located at a virtual hub of transportation lines, both rail and water, the Lake Charles plant is in position to make speedy deliveries by rail throughout the Southwest and shipments by water to points on the Atlantic and Pacific seaboards, along the Gulf Coast, and on inland waterways including the Mississippi River and its tributaries. With plants at Niagara Falls, Saltville, and Lake Charles, Mathieson is able to offer a well-rounded service in all the principal industrial regions of the United States.

No story of Mathieson's progress would be complete without mention of some of the many individuals whose privilege it has been to contribute to the company's steady development over a long period of years. In addition to Mr. Allen and others whose names have already been included, there is J. A. Kienle, now vice-president and director of sales, whose task it was in 1920 to build from the ground up an entirely new sales organization; E. A. Hults, now vice-president in charge of operations, on whom has rested the heavy responsibility of first rehabilitating the company's plants and then maintaining them constantly in a state of high efficiency; C. F. Vaughn, former vice-president in charge of the Niagara Falls works; Max Mauran, a former vice-president, now deceased, whose engineering skill contributed much to the early development of the company; Howard Berry, vice-president and comptroller; H. F. Hyland, secretary-treasurer; E. E. Routh, general manager of sales, whose association with the company dates back nearly thirty-five years; R. J. Quinn, assistant manager of sales; J. R. Schmertz, advertising manager; Harry M. Mabey, general traffic manager; R. E. Gage, director of research and development; Wm. B. Leach, Jr., manager of the Niagara Falls plant; H. A. Ruetschi, manager of the Saltville plant; I. V. Maurer, manager of the Lake Charles plant.

Through the efforts of these men and many others too numerous to mention, Mathieson has thus grown in forty years from its modest beginnings to a great institution of many activities and high prestige, exerting wide influence on the industrial life of the nation.

The location of the new Lake Charles Plant at tidewater is a factor of actual dollars-and-cents value to alkali consumers over a wide area. At the plant docks, water shipments are loaded on steamers serving ports on the Atlantic and Pacific coasts. Barges loaded at the plant make their way to points along the Intracoastal-Waterway and throughout the Mississippi River basin.



From Logwood to Ester Gum

Sixty-nine Years of Service to the Textile Industries by John D. Lewis, Inc.

ESTABLISHED by Dexter B. Lewis in 1866 to manufacture logwood extracts and textile chemicals, but taken over a few years later by his son, John D. Lewis, the company was given the latter's name. The original factory was at Charles and Bark Streets and the office on Exchange Place in Providence. At that time, the company did an extensive business in logwood extracts as the pioneer and largest producer and a substantial business in importing chemicals, starches, and gums from countries of origin.

In 1916, under John B. Lewis, son of John D. Lewis, warehouses were established and offices moved to larger quarters in the Turks Head Building in Providence. New products were developed to meet changing conditions and practices in the textile field. Further growth in 1923 made necessary a plant in Mansfield, Massachusetts, to which all manufacturing was moved. Here, one year later, the company began manufacturing synthetic resins and gums for use in enamels, lacquers, varnishes, inks, etc. The gum and resin business has shown remarkable growth, and the company has become well known for its Lewisol synthetic resins and its Imperial Ester Gum, now both used extensively here and exported to practically every country. A substantial domestic and export business has also been built on the following textile products which they manufacture: tannic acid, antimony salt, tartar emetic and acetate of chrome. Besides manufacturing these textile, paint and varnish products, the Lewis organization acts as authorized distributors for the leading manufacturers of industrial chemicals.

In 1925 a new, enlarged warehouse and office building was erected on the harbor at Fox Point, Providence, where all activities, except actual manufacturing, have been concentrated. Here one of the largest and most complete stocks of industrial chemicals, starches, resins, etc., in New England is maintained for the convenience of the textile, paint and varnish trades.

The company was incorporated in 1931. It is now managed by John B. Lewis, president and treasurer, son of John B. Lewis, the fourth generation to be connected with the company.

The Awakening in Chemistry

CERTAIN anniversaries seem to be fitting times to stop and take stock of conditions, to study progress and to review what has been accomplished. Such an occasion is the meeting of the American Chemical Society which records the three-hundredth year of chemical effort in the United States.

Only a few years ago there was another occasion when the American chemical industry took stock of

conditions. But that occasion was not a very happy one. It was at the time of the Great War, and America was made acutely conscious of the vital lack of many commodities due to the absence in this country of an organic chemical industry such as had been established and developed abroad. There was a trade panic in the face of a shortage of dyes. Medicine found itself greatly hampered because of the absence of important drugs. Even to wage war, the United States found itself obliged to develop quickly essential chemicals formerly made only abroad.

Those conditions have passed now, like a bad dream. There is no terrifying knowledge that we are at the mercy of foreign countries for many necessities. In fact, our chemical industry, reborn since the Great War, has made giant steps forward. Its accomplishments have been extraordinary. It has not only duplicated and improved the productions of many essential materials formerly made abroad, but has given to the world many new, revolutionary products.

The field of chemistry is a vast one, and a full discussion of it could not be confined to the few pages of this publication. It would take books to adequately present it to the public. The few highlights of that progress which are to be mentioned here concern only the products and the work of one company—E. I. du Pont de Nemours & Company. Even the discussion of these highlights must necessarily be brief, because of lack of space, for the literature necessary adequately to describe the accomplishments of this one diversified chemical manufacturing industry, would be quite large.

The public, in many instances, is not aware of the really important progress made in the field of chemistry. But even the average man, who usually does not know the details of chemical progress, can see about him the evidences of this progress. If this average man awakened today from a Rip Van Winkle slumber, which began in war times, he would see all the automobiles completely transformed in finish by Duco; he would

Synthetic chemistry comes to the aid of the American hostess. A buffet bridge luncheon for eight, for which table accessories are in the modern manner both as to materials and design. The cloth is of Fabrikoid, a du Pont lacquered fabric, the cutlery of pyroxylin plastic ivory handles with stainless steel blades, and the serving dishes of wood and of spun aluminum. Further use of modern materials is seen in the dinnerware with three banded design in American ceramic colors, which never wears off. As to modern design, note the comparatively flat plates, the short blade knives, the bold geometric pattern of the cloth, and the plain, sleek shape of the aluminumware.
(Dinnerware by James River Pottery Company.) (Other accessories from Lewis & Conger—of these, the coffee and cocktail sets are by Chase Brass & Copper.)

"Cellophane" for safety and beauty. It is difficult to say which has been the greater contribution of this synthetic material.

discover tires the mileage of which would astonish him; his motor would be knockless, due, he would be told, to a fluid known as Ethyl; almost every familiar package he bought—cigars, cigarettes, razor blades, candy—would be wrapped in Cellophane. His neckties would be of rayon and the lining of his coats, with which he used to have so much trouble, would now be of a durable, attractive material—a synthetic yarn made by chemists. The electric refrigerator in his house and many other every-day articles would be finished in a material described to him as Dulux and which, to his surprise, would be impervious to acids, alcohol and petroleum solvents. The women of the country would be wearing gowns made of rayon, which, only a few years before, had been regarded as a poor imitation of silk, but which, by some magic, had been transformed into the most glorious dress materials and now carried the hall-mark of exclusive fashion leadership.

This average man would also see evidences of many other new things which would be conclusive proof to him that there had been a revolutionary change in conditions. Not being a technical man, he would not necessarily know of the great progress made in other lines, the products of which did not come sharply to his attention in everyday life. He would, however, be conscious of great changes which affected his comfort, the ease of living, and his general enjoyment of life.

There are other developments, besides those just referred to briefly, of supreme importance to the country, which must be taken into account in any appraisal of progress since war days. The United States is now independent of any outside source of supply of nitrates. This is of such importance that, had the conditions of war been reversed, twenty years ago, and the supply of Chilean nitrates shut off by an enemy's control of the seas, the war might have been decided against us. The peace-time value of nitrates as fertilizers and manufacturing ingredients makes the nation strong in its self-sufficiency. Above all, it makes the country impregnable against any attempt to impose arbitrary prices by outside forces, as the result of monopoly.

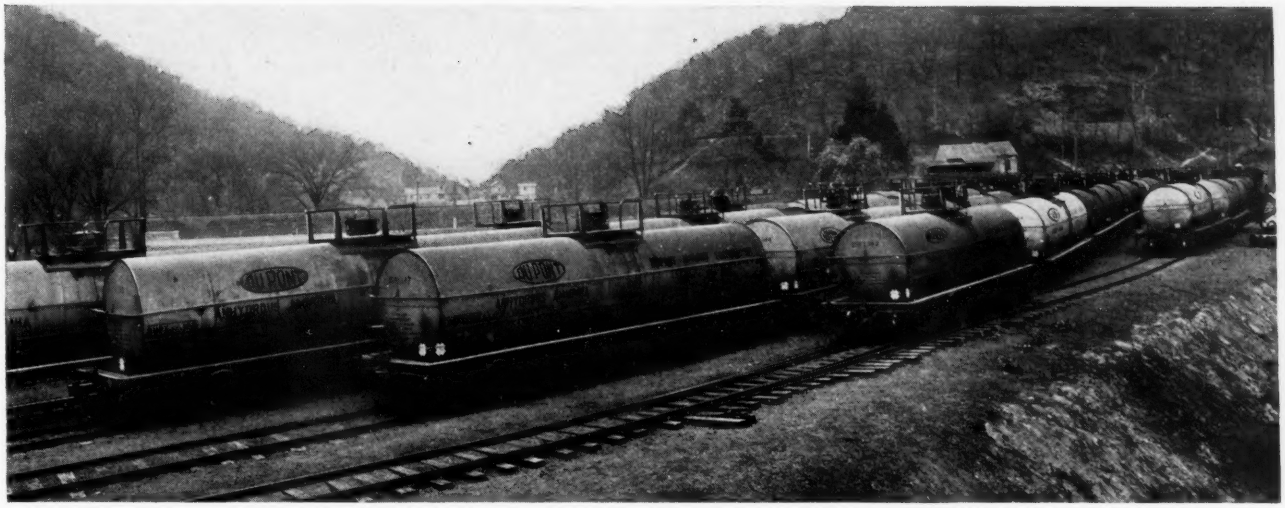
A foreign-controlled monopoly in camphor could also levy heavy tribute and perhaps cripple American industry, had not America developed chemically a camphor to take the place of the foreign materials. Camphor is one of the necessary ingredients in certain branches of industry. In the first place, it has an important part in the development of the new turpentine industry. In the second place, it is the necessary component in the manufacture of the plastics which go into such a widely

Man in order to exist must continually wage war against the ravages of insects. Du Pont sprays and other insecticides provide important weapons in fighting this battle.

known and widely used material as safety glass for automobiles and other purposes. It is also a necessary material in the manufacture of the great number of plastics which are a part of our everyday life. These are represented by combs, brushes, toilet sets and fountain pens, many kinds of pencils, and a great number of decorative objects and novelties. Plastics also enter importantly into industry where they are used for various purposes.

One of the greatest liberating strokes delivered by the chemical industry of this country in recent years concerns DuPrene—sometimes called synthetic rubber. This is of great economic significance. In the first place, in time of war, it makes the United States independent of foreign sources of supply and thus guarantees that, if a serious conflict arose, and the integrity of the country were menaced, there would be no stifling or crippling of industry and the armed forces of the

The Harrison plant of the du Pont Company at Gray's Ferry Road, Philadelphia, is an important link in du Pont manufactures, providing production facilities for many raw materials.



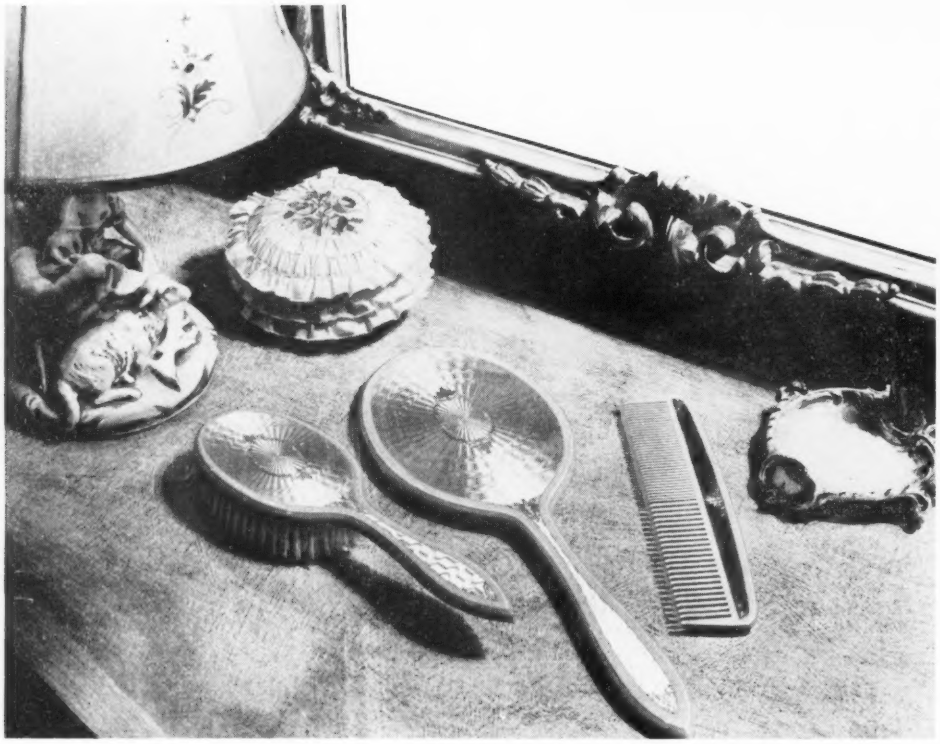
Ammonia for agriculture and industry. Nitrogen (produced by the du Pont Company in the form of ammonia) is a vital necessity in peace or war.

country, as was the case with Germany, due to the lack of rubber and the inability to produce a suitable substitute.

In the second place, it puts the country in an admirable position if a peace-time conflict should arise. Such a peace-time conflict as is envisaged when there is a control or monopoly of natural products and consumer nations are forced to pay whatever prices the monopolists demand.

The "great emancipation" for the United States came, chemically speaking, when this country embarked on the dye-manufacturing business. It is hard to visualize now the panic that reigned in all the dye-consuming industries at the time of the Great War, when they found themselves face to face with a complete cessation of supplies of fast dyes. Long prior to the Great War, there had been various attempts to establish a dye-manufacturing industry here, but each time, the effort had been defeated by a certain section of the consuming industries, who insisted on the free entry of what, to them, were raw materials, i.e., dyes. No one realized how short-sighted this policy was until the war came and the United States was confronted with an emergency. When the blockade became effec-

The first home of E. I. du Pont de Nemours & Co., built by the founder of the company in 1802.



On milady's dressing table—a Pyralin toiletware set of Cloisonne Lucite, a reproduction of luxuriant French enamel—a handsome accessory to any dressing table. An important feature of this synthetic material is that it does not break or chip, an improvement made possible by the du Pont patented process of built-in decoration.

tive, those industries found themselves face to face with the inability to get dyes. But, more than that, the medical, chemical and many other lines of effort, discovered that without an adequate dyestuffs manufacturing industry in the country, they could not proceed properly with their enterprises.

The American dyestuffs manufacturing industry sprang into being and under terrific handicaps tried to supply the needs of the trade. The industrial and technical problems were in themselves so baffling and intricate that their solution was enough to tax the resources of the most brilliant industrialists and chemists. The day was won, and the establishment of an American dyestuffs industry has meant the safeguarding of the country in time of war; the liberation of American industry; new help to—and a perpetual development ground for—the study and production of vital elements and drugs and medicines; and the establishment of a training school for chemists so that we now have in this country a large group of qualified technical men in chemical matters.

The synthetic organic chemical industry, thus established, and of which the manufacture of dyestuffs is a part, has been most prolific in developing products of

broad economic value. It has constantly widened its field. Research continuously going on opens up new and broader avenues of accomplishment. In addition to dyestuffs and DuPrene mentioned above, the du Pont industries have produced such needed. materials as rubber accelerators and anti-oxidants, seed disinfectants, and petroleum chemicals, included in which are tetraethyl lead, gum inhibitors and high pressure lubricants. Among the fine chemicals produced are embraced perfume bases, photographic developers and vitamin D. Other products are detergents and textile assistants and finishes; alcohols and solvents; and refrigerants.

These developments, important as they are, constitute, nevertheless, only a part of du Pont's contribution to chemical manufacture. Since it is hoped that the present celebration of the American Chemical Society will

A smart deviation from the ordinary chintz with which American women have been wont to decorate their dressing tables is this Cellophane cover which has the appearance of luminous organdy and which drapes in a most attractive manner.

Opposite page and below, panoramic view of the huge dye works of the du Pont Company at Deepwater, N. J. America's dependence for dyes, so poignantly evident after the outbreak of the World War, is now happily a thing of the past.

"The Cellophane Room." Furnishings of this room are all made of "Cellophane" materials, and portray the suitability of these materials for interior decoration.

serve to bring to the attention of laymen the vast part which the chemical industry plays in their lives, let us go back for a moment to the average man, about whom we were speaking, and discuss certain phases of this work in which he is sure to be interested.

Let us say first, however, that, to the uninformed, the fact that the du Pont Company makes a great many products used in a wide variety of industries might give the impression that the company is entering many kinds of new and unrelated lines. This, however, is not the case. Its products are developed from the same or, at least, related bases. Moreover, the chemical interrelationships are numerous and close.

An important thing for the average man to know is that the company has recently developed dyestuffs in the class of new vat colors for cotton. These are the fastest colors known and for that reason are among the most important of the synthetic dyes. It means that cotton shirts and other goods, so dyed, will resist fading to an unprecedented degree. It will mean that the shirts of the average man can be washed until the fabric is worn out, without losing their fast colors.

There are also recently developed organic dyestuffs of a type which, when dispersed in rubber, give a wider range of shades and tints in fabricated rubber articles, and make possible, for the first time, the production of hard rubber in a wide variety of colors.

Air-conditioning is a subject very much to the fore nowadays. Everyone is interested in the efforts being made to condition the summer air in houses economically, and to make us comfortable in those hot seasons, just as heating arrangements make us comfortable in cold seasons. "Freon" is a refrigerant developed in the past few years and now widely used in the air-conditioning of railroad trains, office buildings, homes and ships, including merchant marine, submarine and other warships. The marketing of methyl formate for use as a low-pressure refrigerant has also been initiated.

Today milady need not fear the ill appearance which scuffed heels give to shoes, for plastic covered heels prevent scuffing, and are rapidly replacing leather. Du Pont Pyraheels come in a wide variety of design and are easily matched with the various colors so popular in leather today.

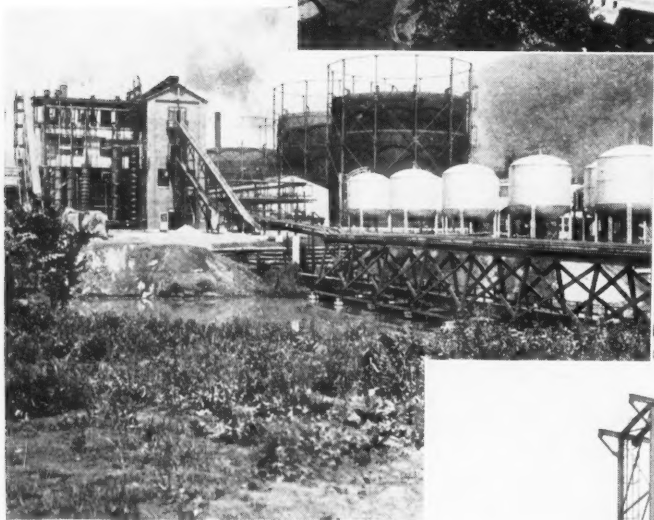
This product has not heretofore been used commercially for this purpose.

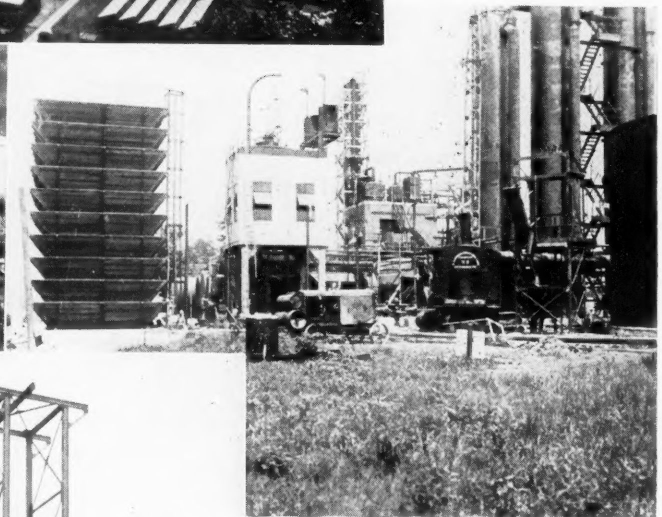
Let us say a few words about agriculture. The food supply of the nation is, of course, of paramount importance and anything which can make it safer, improve it, or facilitate the production of it, is a matter of prime importance to everyone. The contribution of the du Pont Company's research and development staff to agriculture has been considerable. In addition to dynamite for farm use, new and improved insecticides have been developed which have resulted in distinct savings for the farmer. A great deal of important chemical work is being done to protect crops. Much progress has already been made and further important progress is expected. "Dutox" has been found to control the corn-ear worm, tomato fruit worm, coddling-moth, blister beetles, rose chafers, Mexican bean beetle and other insects. "Manganar" controls black spot, brown canker and mildew on roses and other plants, and is an excellent insecticide for use on tobacco and fruit. There are improved seed disinfectants for treating seeds to insure that every seed planted will germinate into a healthy seedling, at least not handicapped by disease at its birth. New fungicides for citrus fruits have also been produced. These have a distinct bearing on the production of more and better crops.

Up to within recent months, this country has been dependent on Germany for its urea supply. This chemical is necessary for agriculture and other uses. Urea-Ammonia liquor, a liquid product containing urea, has attained wide acceptance as an ingredient of mixed fertilizers based on superphosphate. The establishment of a manufacturing plant in this country to produce urea by a new and improved process developed by du Pont is another triumph for American chemists.

The average man also occasionally buys a book. It will be of interest to him to know that he can now purchase these in bindings which look like cloth and are in the price range of good cloth bindings, but which are impervious to water, dirt, grease, and cannot be attacked by insects. These bindings can be cleaned with soap and water. The children can discolor them and even disfigure them with ink or grease, and it is no job at all to clean them. It is a revolutionary im-

To complete the ensemble du Pont presents Pyralin, a synthetic material especially adapted to the manufacture of bags; its chief characteristic being wearability. It is particularly well thought of and much sought after by stylists because of the wide variety of designs in which it is available.





Du Pont Ammonia Corp., at Belle, W. Va. Top, a general view of the plant; the ammonia unit is just beyond the large tanks close to the river.

Left center, view from the extreme left of the above picture. Construction work on the new benzol recovery plant just out of the picture on the right. Below, the new synthetic urea plant.

provement in the bindings of books and is a development in the lacquered fabric industry. The du Pont Company has named this new fabric "PX Cloth."

It would be possible to continue to list product after product made by the chemical industry, which are of the utmost importance to the country and of economic value in its life. There are many others of great importance which enter into manufacturing operations and which do not come directly to the attention of the average man. These few have been mentioned here in the hope that those not intimately conversant with chemical progress may get some idea of the great progress made.

It should be said and emphasized that success in the diversified chemical manufacturing industry depends on the maintenance of large chemical and engineering research organizations.

A great amount of work is done in chemical control which results in maintenance of quality and yields. Other important expenditures are necessary for the improvement of existing processes and products and the development of new industries.

During the past three years approximately 300 products have been placed on the market. Some of these have been of a revolutionary nature. Others are related to improvements of existing materials.

The Ducktown Basin

Its Ore Deposits and their Development

LYING mainly in the southeast corner of Tennessee is a broad plateau about 12 miles long by 8 miles wide, with an altitude of 1700 feet and surrounded by the mountains of the Blue Ridge range. Beneath the surface of this plateau have been found the largest and most important deposits of copper and iron sulphide ore known to exist along the Appalachian system.

In early days, this section was the roving ground of the Cherokee Indians, and it took its name of Ducktown from Duck, one of their chiefs.

Beginning with the discovery of metallic minerals in 1843 by gold prospectors, mining interest in the district increased, so that by 1855 some fifteen of the more important of the ore bodies in the Ducktown Basin had been located, mine shafts had been sunk, and smelting of the ores for their copper content had been started. During the 88 years since 1847, when the development of the Ducktown mines really began, it is estimated that the companies in the district have produced over 500,000,000 pounds of copper.

The Ducktown ores commonly smelted or shipped during the 1850's and '60's contained from 20 to 40 per cent. copper. Such high grade ores permitted crude methods of recovery. The ores now available are of value mainly for their sulphur and iron and contain only about one per cent. copper; and the refinements of metallurgical and chemical processes used in the treatment of these ores represent a notable pioneering achievement in the face of many obstacles.

The first smelter in the district was erected in 1854. During the next four or five years four more were started. In 1858 several of the mining companies combined under the name of the Union Consolidated Mining Company to form the first large enterprise exploiting the Ducktown ores. This company controlled about half the developed ore bodies in the Ducktown Basin and operated with more or less interruption for twenty years. With steadily diminishing copper content of the ore and also with falling prices for the product, this company finally got into difficulties and closed down in 1879. The mines remained idle thereafter until 1890.

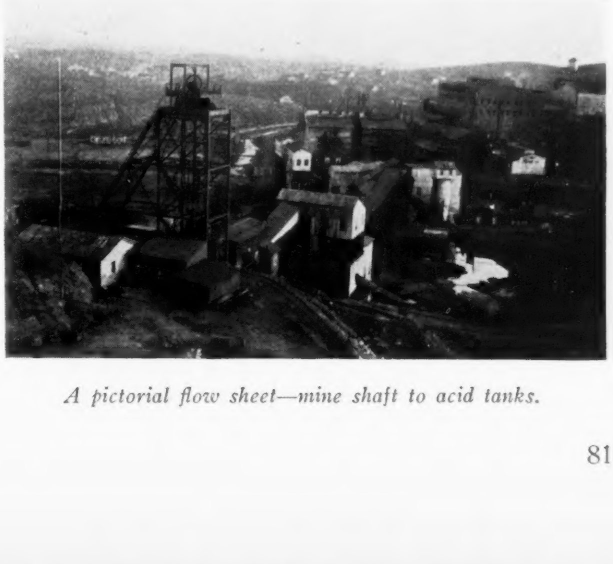
Meanwhile, the progress made in copper metallurgy, particularly in the treatment of copper ores in blast furnaces, instead of by the old Welsh process, interested an English group. In 1890 these gentlemen organized the Ducktown Sulphur, Copper & Iron Co., Ltd., took over a large part of the Union Consolidated holdings and started operations. It is interesting to note that, as their name implies, they then had ideas about recovering the sulphur and iron from the ores, as well as the copper; but after two years of trial in this direction, they decided to confine their activities for the time to copper and built a 100-ton Herreshoff copper blast furnace at Isabella, adjacent to one of their more important mine workings. Later a second blast furnace was built.

In 1893, their first operating year, the company produced and sold about 620,000 pounds of copper. Thereafter, their operations steadily expanded to the point where they produced upwards of 8,000,000 pounds of copper per annum, with a very satisfactory yield of dividends to the English shareholders.

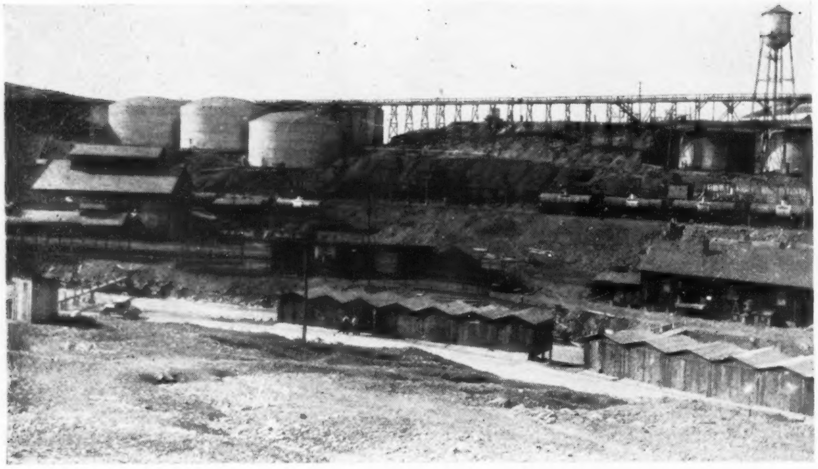
The Ducktown ores contained better than 40 per cent. iron and about 30 per cent. sulphur. This sulphur content was too high for smelting; and in line with the practice of all the companies operating in the district the ore was heaped out on the landscape and roasted, to burn off the excess sulphur. The sulphur fumes arose from these roast heaps in dense clouds, with the result that in time the Ducktown Basin for miles around the smelting plants was denuded of its forests and of all other vegetable growth. The continued emission of this gas incited the nearby farmers to complaints and damage suits which grew in number and vigor.

In an effort to remedy the objectionable conditions, the Ducktown Sulphur, Copper & Iron Co. succeeded in developing for the first time in this country the process of so-called "pyritic" smelting, which utilized the sulphur in the ore as fuel in the blast furnaces, displacing the costly coke formerly used. This process permitted the use of the ores containing high sulphur, so that by 1904 heap roasting in the district had been entirely eliminated. Following this advance, there were developed at various times thereafter other important improvements in equipment and technique looking to better economy in the recovery of copper and sulphur under the conditions of pyritic smelting.

This basic change in the metallurgy of copper smelting rendered possible the realization of the dream of the founders of the Ducktown Company, which thus became one of the pioneers in an outstanding metal-



A pictorial flow sheet—mine shaft to acid tanks.



Storage tanks and tank cars, the guarantee of deliveries to a seasonal market dependent on cotton growing.

lurgical development: the manufacture of sulphuric acid from copper blast furnace gases. Meanwhile, the Tennessee Copper Company, formed in 1899, acquired mines in the Basin and built a plant at Copperhill, four miles south of the Ducktown smelter and in 1901 began operations which were worked out along essentially the same lines.

Sulphuric acid is used in large quantities in the manufacture of phosphate fertilizers. In Tennessee, Florida and elsewhere in the South were large deposits of phosphate rock, the value of which depended on a cheap and abundant supply of acid. Impoverishment of soil by the constant growing of cotton and other crops, the economic base of life in the Southeastern States, created a need for millions of tons of fertilizer annually. This combination of circumstances synchronized with the improvements in smelting practice in contributing to the expansion of the Ducktown enterprises.

Thus, to quote Emmons and Laney (*U. S. Geol. Survey* 1926), "an industry that was formerly considered wholly inimical to plant life has become an aid to the production of vegetable foods. Among the contributions of the Ducktown operators to the world's wealth, the solution of the problems involved in the utilization of low grade sulphurous fumes from blast furnaces is one of the greatest value."

In order to meet the gradual but steady decline in the copper content of its ores, the Ducktown Company in 1920 erected a concentrating mill at its Mary Mine for the treatment of these lower grade ores. The process of differential flotation was employed, by means of which the metal content was concentrated and the waste material largely eliminated, with a yield of separate products of copper and iron concentrates. Thus ores previously considered valueless became profitable.

In the aftermath of the Great War, with sharply reduced consumption, swollen inventories, and low prices, the Ducktown Company suffered like many other industrial and mining enterprises; and the result was a receivership in 1923 for the old English company.

An energetic group of New York and Chattanooga business men were impressed with the possibilities of the enterprise, however, and in 1925 they organized the Ducktown Chemical and Iron Company under Delaware laws, effected the discharge of the receivership, and took over the assets of the old company. They hoped to utilize on a larger scale the iron, as well as the copper and sulphur, from the Mary concentrates, and made some progress in that direction.

In 1927 a new group of Northern interests bought control of the new company from the New York and Chattanooga owners and planned a larger operation on the basis of the copper-sulphur-iron flow sheet in line with definite ideas which they entertained.

Isabella Mill, (center) where the differential flotation process catches the values that formerly were lost.

Roasting and sintering plants, which process the iron concentrates into "sinter" for the Birmingham steel makers.

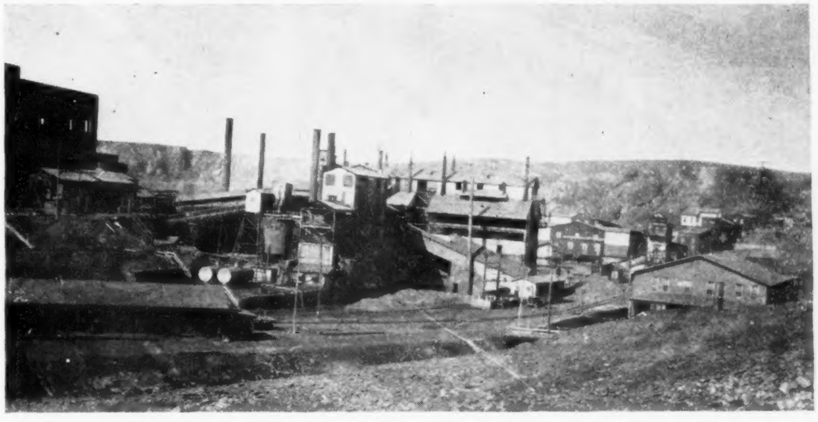
Their views were confirmed by exhaustive mining and metallurgical reports which recommended a program of operations based on the prospect that the Isabella mine of the company alone would provide sufficient ore of suitable grade. This recommendation was amply justified by later developments which put definitely in sight enough ore to operate at present capacity for at least fifteen years, with as much more reasonably to be expected. Thus, there was assured to the new enterprise that basic essential to such an undertaking, a long-lived ore supply.

The metallurgical program called for the erection and operation of a concentrating mill for the treatment of the Isabella ores by flotation, which had already been employed at the Mary mill. A mechanical roasting plant had been built, through which the iron concentrates from the Isabella ores were now put for the release of their sulphur to the sulphuric acid plant. The residues from the roasters were converted to a semi-fused product called "sinter" containing 65 per cent. iron or more, a trace of residual sulphur, and no phosphorus. In this latter form the formerly unrecoverable iron was converted into a product which found a market among the pig-iron and steel producers in Birmingham, Alabama, much of whose local supply of iron ores contained phosphorus in objectionable amounts. Thus a further major step in utilizing the natural resources of the Ducktown Basin was developed by the Ducktown Chemical and Iron Co.

The sulphuric acid produced by this company had hitherto consisted entirely of so-called chamber acid of a concentration of about 77 per cent., and was sold mainly for the making of superphosphate used in fertilizer. Within two years after the new group's entrance into the company, a plant was started for the manufacture by the contact process of sulphuric acid of 93 per cent. strength and upward in order to meet a demand for such grades in the petroleum, explosive, textile, rayon, steel, and chemical industries.

With the first operation of this contact plant in 1930, the Ducktown Chemical and Iron Company had thus completed an advancement of its processes and an integration of its operating units: mines; concentrating mill; roasting, sintering, and acid plants, both chamber and contact; copper smelter; company railroad; tank cars; and storage facilities. This integration covered the transition from the old days of dependence on high grade copper ores alone to the present utilization of all resources and the diversification of products. It has enabled the enterprise not merely to survive but to triple the output of its major product, sulphuric acid, to build up a large ore reserve for the future, and, except during the extreme depression period, to make substantial profits.

Not the least of the benefits of the development of the industries in the Ducktown Basin has been the livelihood given to the ten thousand people in the district who depend directly or indirectly upon them.



Another view of roasters and sintering plant and part of the sulphuric acid plant.

Chemicals for Textiles

EARLY in this century Jacques Wolf began to manufacture those special chemicals used in the processing of textiles, many of which were being imported from abroad; and since the year 1901 many new developments resulted from research work in his laboratories. In addition to new scouring and cleaning agents for cotton, wool and silk, he placed on the market, for the first time manufactured in the United States, Monopole Oil, a double sulphonated castor oil which overcame many difficulties in the use of hard water in dyeing.

Jacques Wolf & Co. has long been engrossed with the necessities of the textile manufacturer and constant investigation was carried on to satisfy the wants of the dyer, finisher, etc. Recognizing the need for special soluble gums for use as printing thickeners for pure silk, their laboratories developed and marketed natural insoluble gums treated by a special process to make them soluble. This was an initial venture which led the field in printing thickeners of this type. Since then their laboratories have continued to improve these gums until today the exacting specifications of the textile printing trade make it not only necessary that these gums be soluble but that many of the natural chemical compounds which occur in them be removed. These products are sold under the trademark name of Supertex gums.

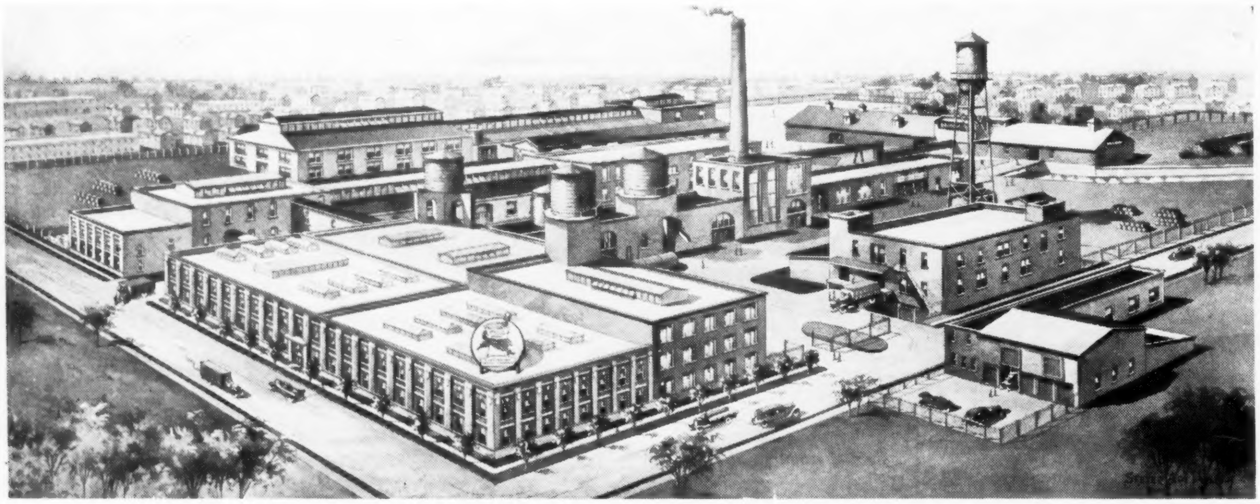
Just previous to the outbreak of the World War these laboratories developed for the first time in the United States the manufacture of formaldehyde sulphoxylate. The war cut off supplies from abroad, and but for the research work of these laboratories, the textile printing trade would have been irreparably injured.

Jacques Wolf & Co. readily appreciated the importance of the sulphoxylates and turned their entire investigating staff to the problem of improving this chemical. For the first time in the United States, in 1914, they produced a satisfactory printing solution of sulphoxylate of sodium formaldehyde. Continued investigation brought a better product, and finally the dry material testing approximately 80 to 85 per cent. hydrosulphite sulphoxylate. This was a boon to the textile printing in this country and placed it in position to carry on discharge printing.

Since the days of pioneering, Jacques Wolf & Co. has sought new methods in purification and concentration until present materials are 100 per cent. pure, clear dissolving sulphoxylates which are used on all textile fibres where the discharge type of printing is carried on. Their product is sold under the trade name of Hydrosulphite A. W. C.

Necessities of the trade have brought about many new developments since the war and among the products manufactured is tetrachloride of tin for the weighting of silk and numerous metal by-products. Diastatic and proteolytic enzymes for use in the textile field as well as food purposes, have also been developed by the Biological Laboratories.

For the past third of a century the aim has been to place before the American manufacturer the best products necessary for his work, and to carry on investigating forces to assist him. This company has been part and parcel of the early development of chemicals applied to textile fibres and they dedicate themselves to a continuance of this policy.



The Jacques Wolf & Company plant in Passaic, N. J.

Above, general view of the terrain at Freeport Sulphur's gigantic new development in Louisiana.

Below, Freeport's plant at Grande Ecaille.

Thirty-two Years of American Independence in Sulphur

THE development of the American sulphur industry goes back to the year 1869 when sulphur was discovered in Louisiana during oil prospecting operations. Two hundred and sixty feet of alternate layers of sulphur and limestone were discovered underlying sixty feet of massive limestone. This limestone formation was encountered after drilling through four hundred and fifty feet of quicksand, gravel, and unconsolidated sediments. As so often happens, considerable litigation developed in deciding whether or not petroleum rights included sulphur rights. Shortly after a definitive settlement of this question was reached, several companies, one after another, attempted to extract the sulphur. In one of the attempts a shaft was sunk to a depth of over one hundred feet only to be abandoned when several of the workmen were killed by noxious gas, the shaft line collapsed, and other difficulties were encountered. After this initial period of attempts to mine the sulphur deposit by the usual mining methods, activities were largely confined to promotion efforts.

Early History

In 1890 Herman Frasch, at that time already a power in the technical development of the petroleum industry, became interested in the possibilities of the Sulphur Dome. His study of all of the information he could find regarding the nature of the formation convinced him that if the sulphur was to be brought to the surface, it would have to be by some new and novel method. The present American sulphur industry owes its start and to a considerable extent its present-day development to the power of imaginative thinking, the courage and persistence of this father of the industry.

The first patent covering the Frasch process was applied for in 1890 and was issued on October 20th, 1891. Up to this time nine-tenths of the world's supply of sulphur was produced in Italy, and for all practical purposes none was produced in the United States. By 1893 the Frasch process was being investigated in Louisiana, and about a year later five hundred barrels of sulphur had been pumped in liquid state from the property discovered in 1869. Production of commercial quantities did not begin until 1903. During the next ten years the American industry grew by tremendous strides, all of the sulphur being produced from this one property. Since that time other salt domes with overlying cap rock containing sulphur have been discovered and intensively developed, until at the present time the American production from these deposits accounts for over seventy-five per cent. of the world's production.

Occurrence

Sulphur occurs in the coastal region of the Gulf of Mexico in limestone formations overlying salt intru-

sions. These unique salt masses were apparently extruded from a tremendous reservoir of salt lying at a very great depth. The salt-dome structure consists essentially of the salt core, cap rock, and the adjacent overlying country rock or unconsolidated sediments. The salt core is usually a roughly elliptical plug composed principally of sodium chloride which often is of as high purity as 99.5 per cent. The cap rock found above the salt in most of the domes is from a few feet to several hundred feet thick, and consists of limestone, gypsum, anhydrite, sulphur, and sometimes overlying sedimentary rocks. No entirely satisfactory and generally accepted explanation has been brought forward for their formation or for the genesis of the sulphur contained.

Up to the year 1923 some forty domes had been discovered, principally by means of surface relief, petroleum seeps, gas seeps, saline springs, and so forth. Since that time the development of geophysical prospecting by magnetic, electric, seismic, and other methods has been rapid, and more than a hundred domes have now been prospected. Not more than a dozen of these contain sulphur under conditions permitting profitable exploitation.

The Frasch Process

The requirements for making the Frasch process applicable are first, that the sulphur-bearing formation shall be sufficiently porous to permit the flow of hot water through the rock; second, that the cap rock shall be sufficiently deep but not too deep below the surface, so that the hydrostatic pressure on the formation shall be sufficient to keep water at the melting point of sulphur from flashing into steam; and third, there must be sufficient sulphur to pay for the large installation cost of the necessary plant.

The Frasch process consists essentially of pumping super-heated water into the sulphur-bearing formation, causing the sulphur to melt and gather in a pool at the bottom of the well. This molten sulphur is then pumped to the surface by means of an air lift. The equipment of the wells consists of a 10-inch casing which extends from the surface down to the cap rock. Through the casing an 8-inch pipe is inserted to the bottom of the sulphur-bearing formation. This pipe is perforated for the bottom 35 feet and carries water at 300°-340°F. almost to the bottom of the well. A 4-inch concentric pipe is inserted inside the 8-inch pipe and rests on a ring a short distance from the bottom. This pipe serves to convey the molten sulphur from the pool at the bottom to the surface. The smallest pipe of all, 1¼ inches in diameter, passes down inside of this molten sulphur line to within about 200 feet from the bottom and carries the air used to lift the sulphur up through the molten sulphur line. Above ground the molten sulphur flows from the wells to small tanks called relay stations, where it is metered and then pumped to large vats in which it is allowed to cool and crystallize. At this point actual sulphur production may be said to end, and from this point on the sulphur industry uses the conventional methods for handling materials.

As the operation is now carried out it seems to the casual observer to be quite simple, but long years of intensive effort and heart-breaking failure went into the development of the mining process which Herman Frasch dared to originate and had the necessary courage and stamina to carry through to successful development.

The Freeport Texas Company

The Freeport Texas Company was incorporated under the laws of Delaware in 1913 as a holding company, and its principal operating subsidiary is Freeport Sulphur Company, incorporated in Texas in 1912. This company began operations at Bryanmound during the latter year, and work has continued there up to the present time. The plant maintained at this property, about three miles from the town of Freeport, Texas, contains all of the equipment necessary for heating and pumping water, supplying steam, compressing air, and generating electric power. The company has not only the sulphur rights but also the oil rights in the property, and at the present time a thorough drilling campaign for oil has been initiated by The Texas Company, which has the oil rights of the property under lease.

On March 14th, 1922, the company entered into a contract with The Texas Company taking over all the rights to the sulphur deposit at Hoskins Mound, which is located near the coast about eighteen miles northeast of Freeport. An efficient plant has been operating on this property since March 31st, 1923.

The excellent facilities possessed by the Freeport harbor permit economic loading of ocean-going vessels at the company's own dock. This harbor is maintained at an average depth of 32 feet.

Louisiana Operations

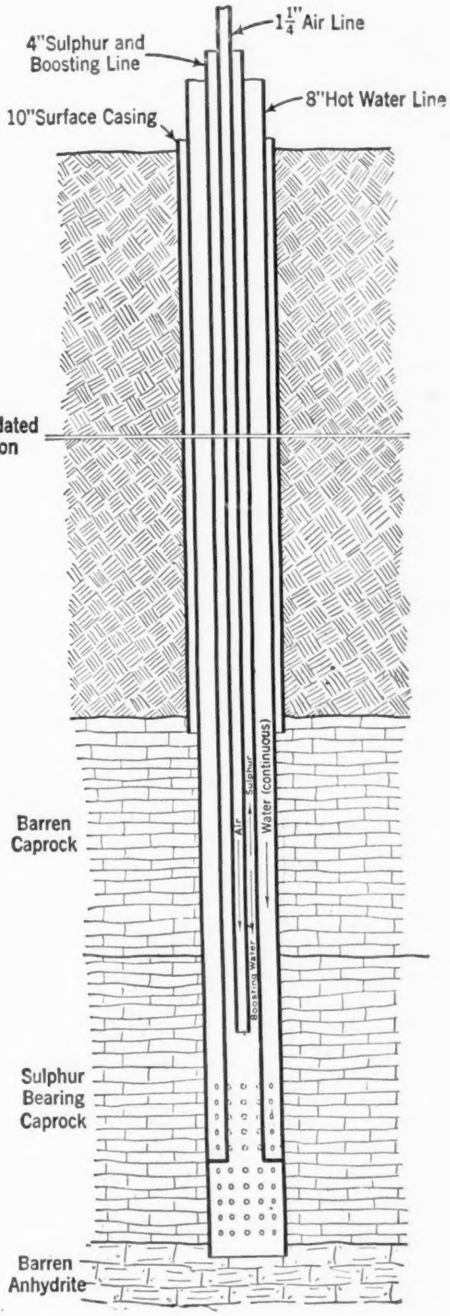
In order to maintain adequate reserves the company acquired in 1932 the sulphur rights on the Grande Ecaille dome in Plaquemines Parish, Louisiana. While the sulphur formation itself has the characteristics desirable in Frasch process mining, the above-ground conditions presented unusually difficult obstacles.

Characteristic of the delta region, the terrain consists of a low, flat, uninhabited area of marsh land interspersed with many shallow lakes and bayous. With the exception of salt grasses, the region is devoid of vegetation and presents, in all directions, an unobstructed path to the vagaries of the winds.

For the prospective operations it was necessary to move in the equipment by water, over a tortuous, uncharted course of seventy miles. The initial attempts at drilling from mats proved slow and expensive, and the expedient of drilling from barges was resorted to.

During the prospecting period the engineering department of the company quickly came to the realization that

the initial problems presented by prospecting were but child's play compared with the task presented by plant construction. A site on the Mississippi River accessible by both rail and highway was selected and purchased as a base for receiving and handling materials and for the general transportation of sulphur. The river terminal has been named Port Sulphur, Louisiana,



Diagrammatic assembly, sulphur well equipment, Hoskins Mound, Freeport Sulphur Company, Freeport, Texas. Although the Frasch process is relatively simple, actual application presents many difficult engineering and operating problems.

where the mine office and a model industrial village have been constructed, with a school, parks, and recreation facilities for the employees and their families. To provide for rapid and economical transportation from Grande Ecaille, a canal approximately 100 ft. wide, 9 ft. deep, and 10 miles long was dredged, involving the movement of some 2,000,000 cubic yards of dirt. A river dock 1000 feet long has been provided for the accommodation of vessels having a draft of as much as 35 feet.

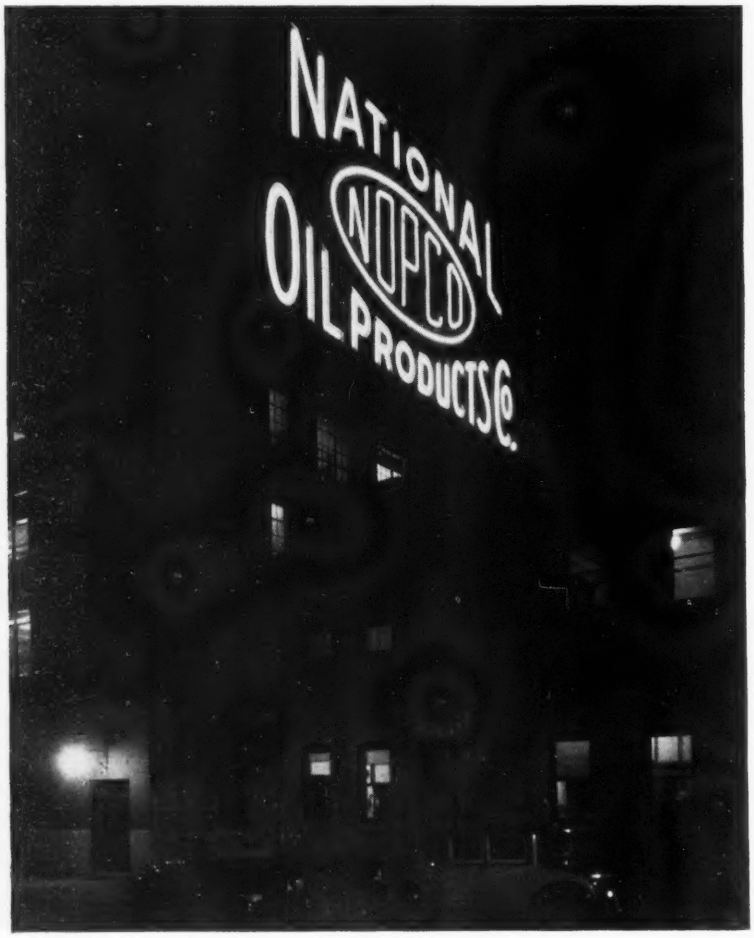
Novel Construction Problems

Every phase of the construction work offered new and intensely interesting problems; chief among these was that of foundations. The ground condition, if fluid mud overgrown with salt grass can be called ground, would not permit the use of any conventional foundation. Foundation designs were based on information from driving and loading tests with piling. It was found that no stratum existed sufficiently close to the surface to be of any value for supporting the piling and that the friction between the soil and the piles must be depended upon solely. From the behavior of the piles during the driving and under load tests, 75 feet was decided upon as the proper length for use in the main structures with a safe load limit of 8 tons per pile. This piling was finally capped with a heavy reinforced concrete mat. Hydraulically made fills are used in the mining area and for vat foundations.

The construction schedule required the utmost accuracy in timing as there was no available storage space for arriving materials. Each piece had to be set in place immediately upon its arrival and any hitch in construction had to be ironed out at once to avoid piling up of material, with resultant delay and the possibility of final breakdown of the construction program due to congested handling facilities. The difficulty of avoiding such confusion and the possible trouble from such a condition can hardly be appreciated by one who has not visited the site and seen for himself the natural—or rather unnatural—condition of the terrain. Only whole-hearted cooperation and team work made the accomplishment possible.

Production Begins

Construction was started early in 1933, and in December of the same year the boilers were fired, superheated water turned into the mile-long pipes to the wells, and the Grande Ecaille sulphur production was under way. Frasch process mining has become such a continuous-flow process that it is impossible to test any unit of a new plant separately; and all has to go off at once when the whistle blows. The boilers come up to pressure, superheated water is turned into the pipes and, as they warm up and expand, the huge swing joints accommodate themselves to the new dimensions of the hot pipes. The water is turned into the wells and, after several hours of anxious waiting during the initial heating period, molten sulphur gushes forth, and later finds its way into the chemical industries of the world.

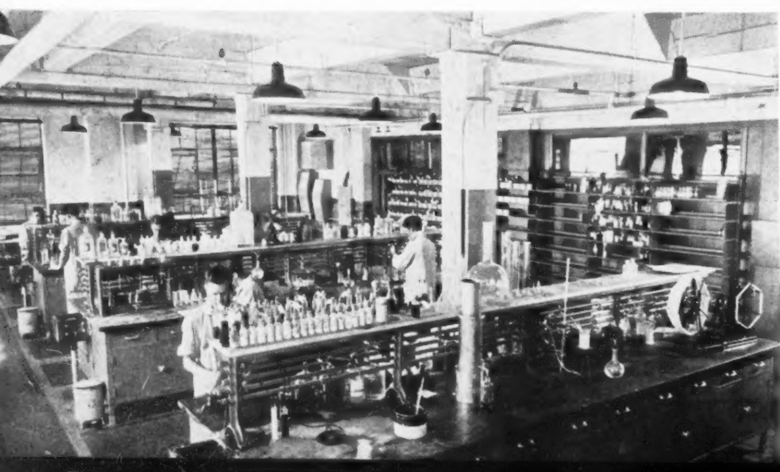


Vitamins and Processed Oils

DURING the steady progress of the chemical industry as a whole, the vegetable and animal oil business has kept stride with the fast tempo of the march. Especially is this true of the sulphonated-oil and vitamin-extraction branch of the industry.

In 1907 an enterprising group of men took over the firm then known as the Turkey Red Oil Company, manufacturers of sulphonated oils and soaps since 1876, and carried on with new driving force as the National Oil Products Company. Rule-of-thumb procedure was replaced by modern scientific methods. A definite chemical research policy was established, insuring a sound foundation for future industrial expansion; and this research has been the basis for a gratifying company growth.

Carrying on the research to which National Oil Products owes its growth.



One of the first advances was the introduction to the leather trade of sulphonated cod oils, which supplanted the raw cod oil previously used by tanners. Shortly afterwards a number of distinctly original sulphonated oil mixtures were developed for the rayon, cotton, and silk industries. Two of these oils are still the standard in their field.

Today the National Oil Products Company is the largest oil sulphonating house in the country. Its products find their largest application in the textile industry, with the leather industry a close second. Sulphonated oils also are used in the glue and paper industries; as detergents by laundries; as lubricants in wire drawing; as cutting compounds in metal working; as ingredients of quality printing inks; as emulsifying bases for disinfectants and agricultural sprays; for emulsifying perfume oils; and for a variety of other purposes.

In 1926 investigations on cod-liver oil by the United States Department of Agriculture, as well as by many state colleges, aroused considerable interest in the value of vitamins A and D in poultry and animal husbandry. As Nopco was by this time the largest importer of cod-liver oil in the United States, these vitamin investigations were followed with intense interest by the firm.

Experiments were started in the company laboratories, and the possibilities of this new field definitely established. This marked the entrance of Nopco into the production of vitamin D for animal and poultry feeding. Shortly afterward, Dr. Zucker of Columbia University patented his process for extracting vitamin D from cod-liver oil; and Nopco was chosen as the logical company to commercialize the new product.

Nopco has pioneered extensively in the field of vitamin therapy both for animal husbandry and human nutritional work. The company's Vitamin A and D Concentrate, supplied to farmers today, is the standard of excellence by which all other vitamin carriers are judged.

Vitex, a vitamin D concentrate accepted by the Committee on Foods of the American Medical Association, is sold throughout the United States and in many foreign countries, as the ideal method of fortifying milk with natural vitamin D. Vitex also finds itself in many loaves of bread.

In the course of many researches on oils, a byproduct with valuable properties as a scalp food was discovered. This resulted in the company entering the cosmetic field with an olive-oil soapless shampoo having radically new qualities and sold under the name of Admiracion.

In 1907 the company employed but one trained chemist. Today its technical staff is composed of thirty trained chemists and chemical engineers, whose efforts are dedicated solely to scientific research and development of new products. The company maintains analytical, biological, bacteriological, and chemical research laboratories.

Technical service played an important part in building up the company. From the very beginning the fact was recognized that the manufacture of a good product is only half the job, and that it is up to the manufacturer to see that the product is properly applied and in a manner that brings out its full advantages. The company has therefore maintained a technical service department at the beck and call of customers whenever they need help in the application of products.

The year 1935 finds Nopco making over 1200 oil products, which go into the industries for lubricating, softening, scouring, penetrating, plasticizing, and defoaming. Many processes are greatly benefited by the use of sulphonated oils, either through saving in material, time, or by obtaining better finished products. Any industry can well look into these remarkable oils.

C. P. Gulick, president and one of the founders of the company.

. . . .

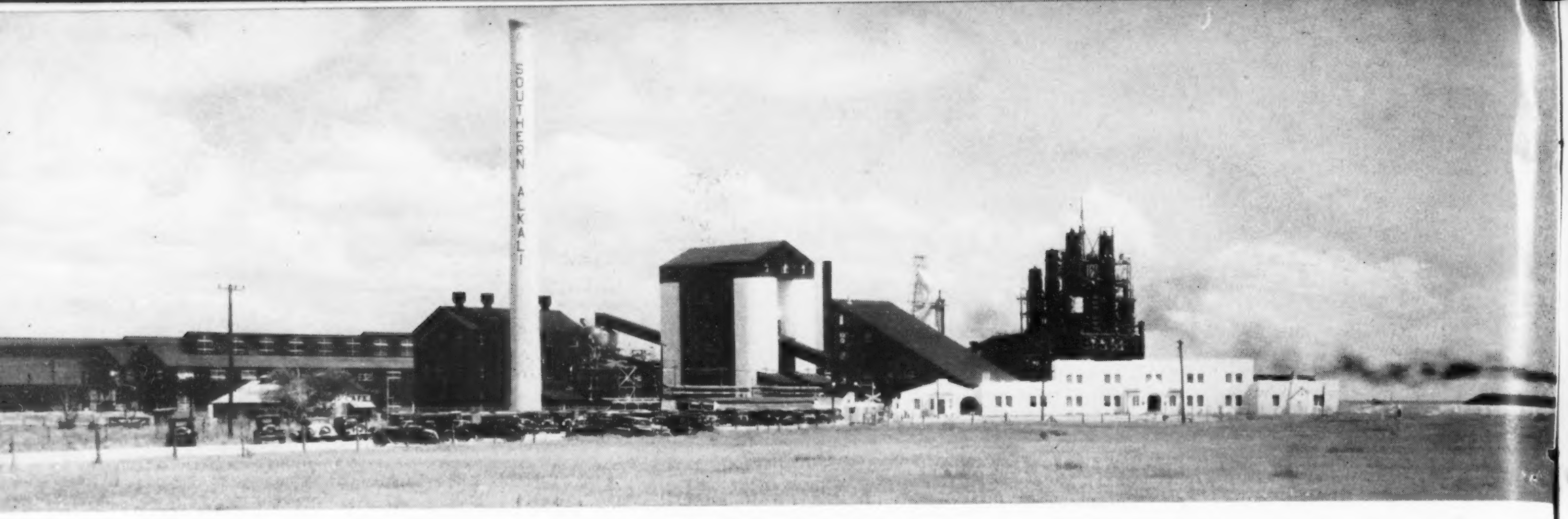
A subsidiary of Nopco is the Metasap Chemical Company, which manufactures chiefly metallic soaps and maintains a research laboratory to develop new chemicals in this field. Among the products made are the stearate and palmitate of aluminum; the stearates of calcium, magnesium, and zinc; and calcium palmitate.

These soaps of the higher metals are used as flattening agents in paints, varnish, and lacquers; as the bases for water-resistant greases; in waterproofing textiles; and as suspension agents.

Both Nopco and Metasap owe their growth to a most active research program in the past; and they look forward to future expansion through a continuance of this policy.

Left, some of the rats used in biological assays to determine vitamin strength.

Right, X-raying a fowl to determine changes in bone structure after administering vitamin D.



BLAZING A NEW TRAIL FOR THE ALKALI INDUSTRY

Southern Alkali Inaugurated Era of Better Service and Lower Delivered Costs for Alkali Consumers of the Southwest.

BY far the most important recent development in the chemical industry has taken place in the Far South. There, in a comparatively short space of time, a complete new industry has sprung into existence, and a section of the country which formerly had to depend almost entirely on outside producers for alkali has now its own fully adequate local source of supply.

It was Southern Alkali that pioneered this whole expansion and development. The plant of the Southern Alkali Corporation was finished in September of last year and was in full production and making shipments by October, 1934.

Important Contribution

An adequate home supply of basic alkalies has for many years been one of the recognized needs of the industries of this part of the country. By locating in a new section and giving alkali consumers all the advantages of improved service and lower laid-down costs, Southern Alkali took the first constructive step toward fulfilling this important industrial need. This was pioneer work in blazing a new trail for industry. It is a distinction that no other alkali-producing company can lay claim to.

Many Industries Benefit

This development inaugurated by Southern Alkali is certain to give new stimulus to the local industries of the South. Petroleum refineries, soap factories, paper mills, glass factories, cottonseed oil refineries and other industries using alkalies now have available a convenient supply of materials at short-haul, low-cost rates. All of which means lower production costs for these industries and the ability to compete on a more equitable basis with manufacturers located in other parts of the country.

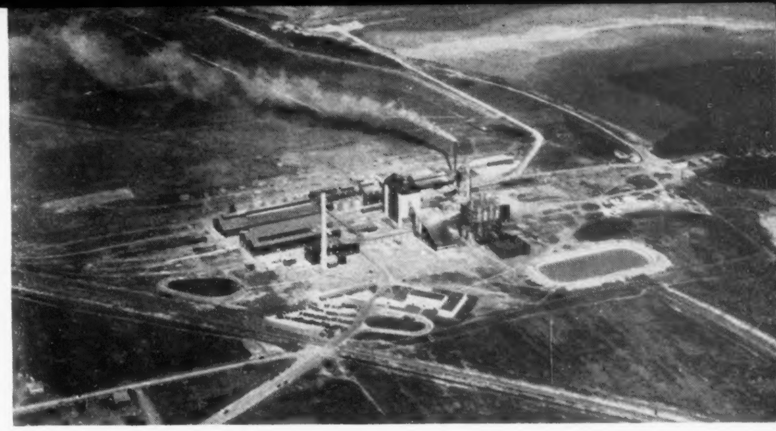
Petroleum refiners, especially, are large users of caustic soda and soda ash. Heretofore they have had to buy these materials in the North—and pay the heavy transportation charges these bulky items involve. Southern Alkali was the first to offer a solution to this problem. Service is quicker now—and more dependable. Laid-down costs are lower.

A Unique Traffic Center

The plant is especially well served by both rail and water transportation facilities to expedite and control to the utmost deliveries out of Corpus Christi. Three

Ocean-going steamer loading at Southern Alkali dock.

railroad trunk lines maintaining fast, "through freight" service bring Southern Alkali into close contact with Gulf Coast and mid-continent concerns. As can be seen from the photographs reproduced here, Southern Alkali has the further advantage of being located on tidewater, with its own dock and turning basin. A new 30-foot channel has been dredged that enables full-sized ocean-going vessels to dock right at the plant site. This means unexcelled rail and export shipping advantages and—for refiners and other industries along the coast—more favorable freight rates.



Airplane view of the Southern Alkali plant at Corpus Christi.

Convenient to Raw Materials

All the requirements for the manufacturer of alkalies are within easy access of the company plant. These include: salt, limestone, coke, oyster shells, and power. The salt is piped from company wells sixty miles away by natural gravity flow and stored in an immense open reservoir. Coke and limestone are shipped to the plant from nearby Southern points. Oyster shells, which are valuable as a source of lime, are obtainable in abundance from the large oyster shell deposits in Nueces Bay.

Vital to the success of any industry that aims at lower production costs is cheap power. And the Corpus Christi site not only has tidewater and convenient raw materials—but natural gas as well. Company wells located only six miles away supply fuel that produces power at low cost.

Outstanding Construction Features

The Southern Alkali plant at Corpus Christi is the product of three years of careful planning and preparation. As an engineering achievement, it incorporates the newest improvements in methods of manufacture and distribution. The men behind Southern Alkali are men of long experience in the alkali field. They are specialists thoroughly acquainted with the special needs of the various industries they serve—men who know and appreciate the importance of high manufacturing standards and efficient service.

This plant is an expression of belief in the industrial potentialities of this section. With its opening, one of the most important chemical developments in the history of the Great Southwest becomes a reality. As one of the new local industries of the South, Southern Alkali joins in helping further that development.

Loading "Southern" brand alkalies at the company's own dock for Gulf and coastwise movement.

Interior of the loading dock. Here stocks are maintained for coastwise and export shipments.

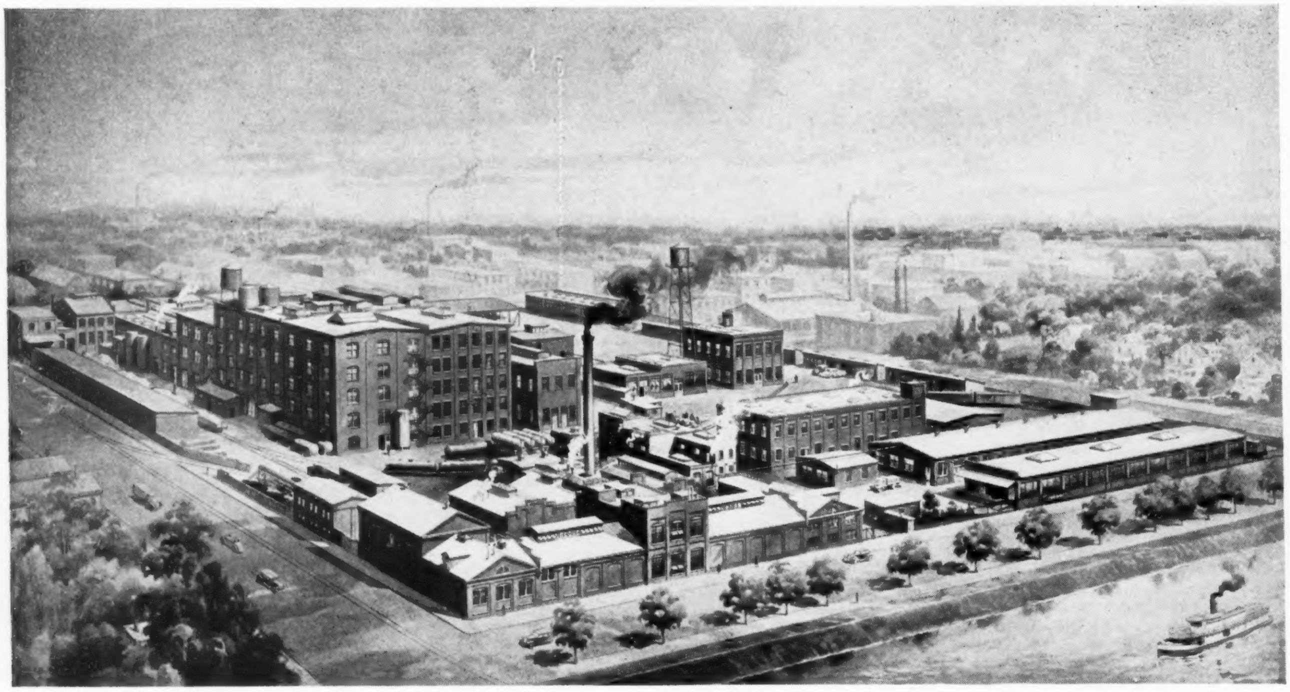
Medicinals and Colloids

The Heyden Chemical Corporation's Pioneer Work in one of the Industry's Most Essential Branches

THE name of Heyden has been intimately associated with fine organic chemicals in the United States since the opening year of the twentieth century. Established originally in Garfield, New Jersey, in 1900 as an affiliate of the Chemische Fabrik von Heyden A. G., Radebeul, Germany, the new American organization had through its affiliation the initial advantage of a sound scientific background and long manufacturing experience, replete with outstanding contributions to medical science and industrial technology.

Shortly after the establishment of the Garfield plant, the construction of the first unit for the manufacture of salicylic acid and salicylates was instigated. With the successful introduction of Heyden salicylates an accomplished fact, other developments followed in rapid succession, resulting in the initial introduction of new, important chemicals. Most significant of these was the erection of the first commercial unit for the production of formaldehyde which marked the American premier of this versatile product. With formaldehyde available it was but natural that Heyden should engage in the production of formaldehyde derivatives, and within a short time such products as hexamethylenetetramine and para formaldehyde were produced in commercial quantities.

In 1905, during the period of development and enactment of the Pure Food and Drugs Act, Heyden turned to the production of benzoic acid and sodium benzoate, which were then under intensive investigation as permissible preservatives for food. Following the definite establishment of the safety of benzoates as food preservatives, and the subsequent legalization thereof, the Heyden products were offered for preservative purposes and have held the continuous confidence of the food and beverage industries ever since. Today Heyden enjoys the reputation of being the oldest established factor in the benzoate field.



The Heyden plant at Garfield, N. J.

Perth Amboy plant.

The use of colloids in medicine is popularly regarded as being a comparatively recent development. However, the original and classic colloidal silver product Collargol was produced at Garfield in 1901. In following years modifications of Collargol were introduced under various tradenames, and the demands of the medical profession finally centered on the two products commonly known for many years as Silver Proteinate and Silver Nucleinate. These products were made official in the last revision of the U. S. Pharmacopoeia as Strong Silver Protein and Mild Silver Protein, and Heyden takes justifiable pride in pioneering in these compounds which play such an important rôle in controlling social disease. A long list of other colloids has been introduced by Heyden, including colloidal copper, sulfur, thorium dioxide, mercury sulfide, and calomel.

Medicinal creosote, creosote carbonate, and such guaiacol derivatives as guaiacol carbonate and potassium guaiacol sulphonate, all of great value in the alleviation of respiratory disturbances, were produced and made available by Heyden to the American trade. Other early products included a full line of bromides and various dyestuff intermediates, such as ortho cresotinic acid.

Following the vicissitudes of the World War, the Heyden organization emerged as an American corporation and within a few years had increased materially the scope of its services to medicine and industry with modern and well-equipped production and scientific facilities at Garfield, New Jersey, and Perth Amboy, New Jersey.

Since the World War, the Heyden Chemical Corporation has developed and attained an enviable position in the production of such other compounds as benzaldehyde, glycerophosphates, beta oxy naphthoic acid, benzyl chloride, and benzoyl chloride. Recently there have been produced and offered to the trade the esters of para-hydroxy benzoic acid, a new and interesting group of valuable preservatives and antiseptics.

It is interesting to note that the principal products upon which the original Heyden venture was established in America have grown in importance with the passing of the years. Salicylic acid, its salts and derivatives, such as aspirin, for instance, are today regarded by the medical profession and the laity alike as being probably the safest agents in general use for the relief of pain and distress in such common ailments as colds and rheumatism in its various manifestations. Formaldehyde, originally introduced as an embalming fluid and disinfectant agent of limited application, has taken its place as a basic raw material in the modern and ever-expanding field of synthetic resins and plastics.

At the present time there are under development in the research laboratories many new and interesting compounds, some related to present Heyden products and some representing radical new departures which may prove to be distinct contributions to the health and well being of the nation, or useful tools for the laboratory of the technologist.

The chosen trademark of the Heyden Chemical Corporation is an adaptation of the six-sided benzene ring. The adoption of the insignia is amply justified by the leading part played by the organization in pioneering in such benzene derivatives as salicylic acid, benzoic acid, guaiacol, benzaldehyde and many others.

Petroleum Solvents to Order

Dividing Crude Oil into Fractions for Particular Uses

NATIONALLY known as refiners of industrial naphthas from crude petroleum, Anderson-Prichard was originally a crude-oil producing organization. The company saw, however, that industry would some day require certain type naphthas, fractionated successfully to replace more expensive solvents and diluents then in common use.

To fulfill this vision, a research division was established in Chicago not to carry out research on petroleum, but for the following purposes:

1. To determine what industries required or could successfully use a petroleum fraction.

2. To study each individual industrial problem and to find out the fraction required.

3. To make available data setting out the limitations of each fraction and its comparative value.

Through much favorable comment by recognized research chemists connected with industry, who had collaborated on some of the earlier completed work, the industry became petroleum-solvent conscious; and through the cooperation of several nationally-known corporations major factory tests were made possible. Much valuable data was thus secured for these large industries.

The present day specifications of their Troluoil, a lacquer diluent with evaporation characteristics of 2° toluol; Petrobenzol, with evaporation characteristics of C. P. benzol; Apcothinner, a radically new deal in V. M. & P. (it is listed by Underwriters' Laboratories) with the evaporation characteristics of zylol, were made standard for the company after many months of laboratory and practical plant experiments.

Anderson-Prichard's outstanding, internationally-known product is "Stod-Sol" (Stoddard Solvent Specification CS3-28), a semi-inflammable product supplied to the dry-cleaning industry in forty states.

Anderson-Prichard's naphtha refinery is at Cyril, Oklahoma, on the Frisco Railroad. They operate another refinery, the Col-Tex Refinery Company, at Colorado, Texas, on the Texas & Pacific Railroad, this plant specializing in the production of asphalts and road oils.

Officers of the company are: L. H. Prichard, president; J. Steve Anderson, vice president; P. H. Anderson, secretary-treasurer; C. H. Dresser and C. L. Mayhall, directors in charge of sales.

The company has extensive holdings in leases in Oklahoma, Texas, and New Mexico, and is a large producer of crude oil, especially in the well-known Oklahoma City field.

Anticipating the needs of industry for more efficient and less expensive solvents, The Anderson-Prichard Oil Company established research laboratories in Chicago. Cooperating with the lacquer, dry cleaning and other large solvent users, the chemists of this company have developed an important series of solvents.

Solvents

THE romantic story of the colony of bacteria—discovered on an ear of corn—which helped win the World War, made the modern lacquer industry possible, and revolutionized automobile production methods, has been told too often to bear further repetition.

When these "bugs" were allowed to feed on starchy materials they produced solvents as products of their life cycle. These solvents proved to be the keys which unlocked the doors to new industries, to new materials, and to new combinations of familiar materials.

. . . . . .

Now a solvent, of course, is just a "dissolver," that is, a material which will bring another material into solution. In general all solvents are liquids, and all liquids are solvents. Each of these solvents or "dissolvers" has a special and individual combination of properties which make it of particular service in some particular manufacturing process.

Water is the great solvent, and its dissolving properties have been utilized from the earliest times. Numerous other solvents have long been used in industry, but the real development and utility of solvents in industry has occurred within the past twenty years; and this growth in the use of solvents is proceeding with remarkable acceleration today.

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The first solvents produced by Commercial Solvents Corporation were those made by the bacteria mentioned at the beginning of this article. These, and other special varieties of bacteria, have been working in the factories of Commercial Solvents Corporation since 1920 fermenting starchy and sugary materials to produce millions of gallons of the solvents: butanol, acetone, and ethyl alcohol. During the course of the bacteriological fermentation large volumes of the gases, carbon dioxide and hydrogen, are produced. These gases are captured, and part of the carbon dioxide is solidified to form dry ice, while all the hydrogen and the remaining carbon dioxide are united by catalytic synthesis to form methanol, commonly known as wood alcohol. During recent years Commercial Solvents Corporation has also been manufacturing methanol synthetically from natural gas. And now acetone, too, is being produced by synthetic means as well as by the bacteriological fermentation process.

From these four basic solvents, butanol, acetone, ethyl alcohol, and methanol a large number of other solvents essential to many industries are derived.

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In the course of extending its operations, Commercial Solvents Corporation has acquired three plants—two in Louisiana and one in California—producing ethyl alcohol from molasses by fermentation with yeast. These plants, together with the other factories of the corporation in Indiana and Illinois, have a combined capacity for producing about one hundred million proof gallons of ethyl alcohol annually. Ethyl alcohol is probably, next to water, the most important and most widely used industrial solvent. Its uses are many and varied.

In the course of manufacturing ethyl alcohol from either corn or molasses still another solvent—amyl alcohol—is obtained as a side-product. Amyl alcohol, too, is not only a useful solvent in itself, but also is converted into several derivative products valuable to industry.

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The broad market for these numerous solvents has been achieved, not so much by displacing old industries to make way for new, or displacing men with machines, as it has by creating new industries, new processes, and new products—thus providing new opportunities for employment of man power. The building of the market for solvents represents that helpful type of new industry which wrests wealth from Nature and contributes it, not to the welfare of the few at the expense of the many, but to the welfare of all. For these solvents enter into the production of the food we eat, the clothes we wear, the automobiles we ride in, the buildings we live in, the furniture that surrounds us, our household and office appliances, the books and publications we read, the films that entertain us, our cosmetic and our sport equipment, our drugs and our medicines, in all our means of transportation and communication.

The introduction of solvents into the industrial picture is like bringing water into a garden. The water meter may tell you that much water is used for sprinkling,

Terre Haute, Indiana. Plant No. 1.

Terre Haute, Indiana. Plant No. 2.

but the measurement of value of the water is not in the number of cubic feet used. You see the mist from the sprayers fall on the ground and disappear. Soon it reappears in juicier vegetables, sweeter fruits, and more beautiful flowers. When solvents are shipped to manufacturers, they disappear from public view like water sinking into the ground. When next you see them you do not really see them at all, but they have given strength to a medicine that sustains you, greater delicacy to a perfume that delights the nose, blossomed into a finer and more lasting finish that beautifies your automobile and your furniture, or entered subtly into some other product you find essential for living or the enjoyment of life.

The research going on in a hundred industries will evolve new uses for solvents now available

Plants of the

Agnew, California.

and will develop processes and products which demand new solvents. The research conducted by the solvents industry will, in turn, develop new solvents, making possible new products and new industries, which, in the years to come, will no doubt contribute to a still more comfortable and more abundant life for all.

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The extension of operations of Commercial Solvents Corporation and the efficient utilization of all by-products has extended the variety of the corporation's products, and those of its subsidiaries, to include not only more than a score of solvents, but also feeding materials, corn oil, whiskey, carbon black, molding resins and molding compounds, industrial and beverage alcohols in their various forms, dry ice, liquid carbon dioxide, and magnesia insulating materials.

Westwego, Louisiana.

Commercial Solvents Corporation

Harvey, Louisiana.

Peoria, Illinois.

Ubiquitous Coal-Tar

ONLY a few generations ago that black, sticky, strong-smelling stuff called coal-tar was almost universally regarded as waste, and was largely disposed of in nearby rivers and streams. Today coal-tar products serve every industry and are familiar to every farm and fireside of the modern world.

From coal-tar have been evolved the thousands of dyes upon which this era of color has grown, antiseptics and drugs that alleviate human misery, roofing and road materials, perfumes and paints, solvents and bases used in the production of innumerable synthetics. In fact, the further science delves into the potentialities of coal-tar, the more varied and valuable become its products and properties.

In the unfolding of the marvels of coal-tar, The Barrett Company has played a conspicuous part. Since 1854, this company has pioneered the coal-tar industry, and from its many plants and laboratories have come an increasing volume and variety of coal-tar products to supply the necessities of civilization and to contribute to the comforts and convenience of life in America.

Coal-tar itself is a complex compound, which varies according to where, when and how it is produced. The Barrett Company draws its crudes from many sources, carefully grades, classifies and refines them to meet rigid specifications.

The Barrett Company's extensive line of coal-tar chemicals, among which are phenols, cresols, cresylic acids, tar acid oils, Cumar and benzol, toluol, xylol and other water white distillates, find their way into every industry from rubber to soap, paint to plastics.

It is in the road-building, roofing and waterproofing fields, however, that The Barrett Company is best known to the layman. No other company has contributed so much to the development of dependable roofing products and methods. For 81 years, Barrett has been America's leading exponent of coal-tar pitch for roofing and waterproofing, and has developed roofs and waterproofing which are now accepted as standard for the country's tallest skyscrapers and greatest industrial structures.

Through another of its major products, Tarvia, The Barrett Company has been privileged to contribute in a movement which has completely changed the tempo of American life—the development of good roads that made automobiles practicable. Tarvia makes an exceptionally durable, easy-riding, skid-safe highway. Thousands of thrifty communities can testify to the value of Tarvia in bringing them "Good Roads at Low Cost."

Coal-tar might truthfully be called "the great protector." From it come the creosote oils that preserve lumber against decay, the pitch paints that guard metal against rust, the protective coatings that are applied on oil and gas pipe lines, fly repellents that rid cattle and horses of insect pests . . . even the humble moth ball that keeps milady's furs safe through the summer.

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(1) Barrett Pipe Line Enamels protect thousands of miles of oil and gas pipe. (2) Famous Boston Post Road at Rye, N. Y., surfaced with Tarvia-lithic. (3) Old New York Central Warehouse, New York, Barrett-roofed in 1868. (4) The new New York Central Freight Terminal is also Barrett-roofed. (5) Tarvia-built State Highway at York Beach, Me., as it looked in 1913, and (6) The same road as it looks today, 22 years later. (7) Moth Balls are coal-tar naphthalene. (8) The Empire State Building . . . All the world's tallest buildings since the Woolworth Building have been Barrett-roofed.

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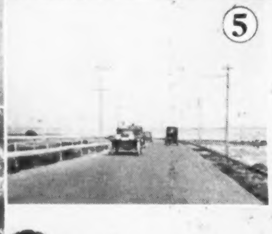

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Nitrogen is the "Growth Element" in Agriculture *. . . . and the "Kick Element" in Explosives.*

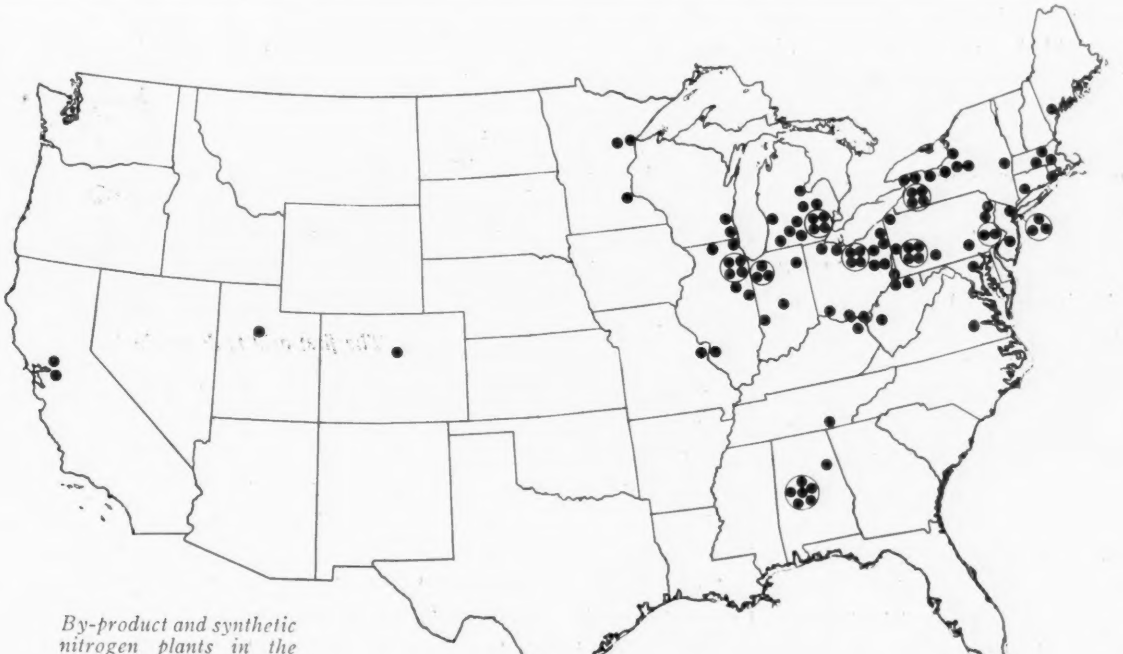
The American Nitrogen Industry

ALTHOUGH the first American by-product oven was built in 1893, the American Nitrogen Industry grew slowly until the World War when the Government encouraged the erection of additional by-product ovens in order to supply the nitrogen, benzol, toluol and xylol needed for munitions. This development made America completely independent of foreign sources of benzol, toluol and xylol and partially independent of foreign sources of nitrogen, all of which products find a use in almost every industry and are vitally essential in many.

The next great era in the nitrogen industry commenced with the construction of a synthetic ammonia plant at Syracuse, N. Y., by the Atmospheric Nitrogen Corporation. This corporation later built the largest nitrogen fixation plant in the United States at Hopewell, Va., which, together with other plants, makes America self-sufficient in its nitrogen needs for Peace and War.

From the inception of the American nitrogen industry The Barrett Company has led in the development of the use of nitrogen in industry and agriculture and has pioneered in the sale of Arcadian, The American Nitrate of Soda, and sulphate of ammonia, anhydrous ammonia, nitrate solutions, ammonia liquor and light oil distillates.

While nitrogen itself is one of the most inert of the elements, in certain combinations with other elements it is one of the most active. It packs a terrific "kick," being the growth element in agriculture and the element from which modern explosives are manufactured. It is used in all important industries from **A** (*agriculture*) to **Z** (*zinc refining*).



By-product and synthetic nitrogen plants in the United States.

Heavy Chemicals

An 1899 Merger that Became a National Institution

AT the turn of the century, America was emerging as an industrial nation aggressively bidding for worldwide markets. The call for larger, integrated businesses was imperative. Consolidations became the vogue. Larger units had so much more to offer—in terms of manufacturing facilities, market outlets, product improvements, financial resources, reliability. With the imminent expansion of American industry it was evident that the demand for heavy chemicals would forge rapidly ahead. More and more, industry was to become dependent on chemical processes.

Small chemical producing companies vied with each other for local business. But only a strong leader could keep abreast of industry development and render the service so sorely needed by energetic, chemicals-consuming American manufacturers.

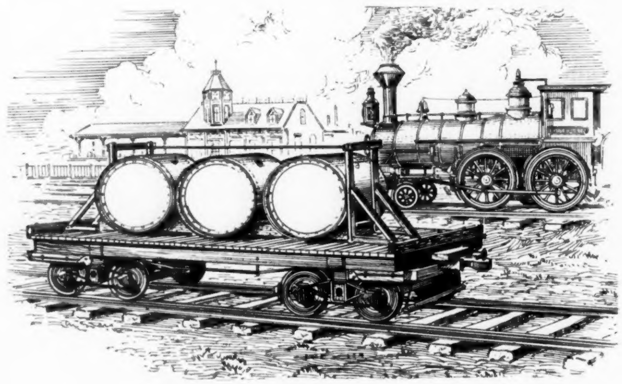
It was natural that one of the first great consolidations should be within the chemical industry. On March 1, 1899, what had been twelve separate chemical manufacturing companies, each comparatively small and each operating a comparatively local business, came together in corporate unity, as General Chemical Company.

Where each of the twelve small companies had been relatively weak, the one consolidated company built its strength—in technical staff, in process research, in plant improvements, in financial resources, and in business management. At the time of its formation, General Chemical Company assumed great industrial importance by virtue of the diversity of its products and the spread of territory which its multiple plants were able to serve economically. That advantage is even more dominant today, resulting from natural expansion in the company's business and from the vision of its management.

In the early years of the company and well before the war, General Chemical had acquired a notable position in its field. Its manufacturing economies, achieved through technical research, had resultant benefits far beyond the company's selfish interests. Product standardization and uniformity had been carried to new high points.

General Chemical Company was then and remains now very largely a strictly chemical company with a preponderant portion of its business in sales to other manufacturers, for whose processes its products are raw materials.

General Chemical Company has pioneered in many directions. It was the first to develop the contact process of sulphuric acid manufacture in America and as a result became able to meet purchasers' specifications in this and other acid products, with uncommon facility. The introduction of the contact process was an important milestone in the history of acid making in this country.

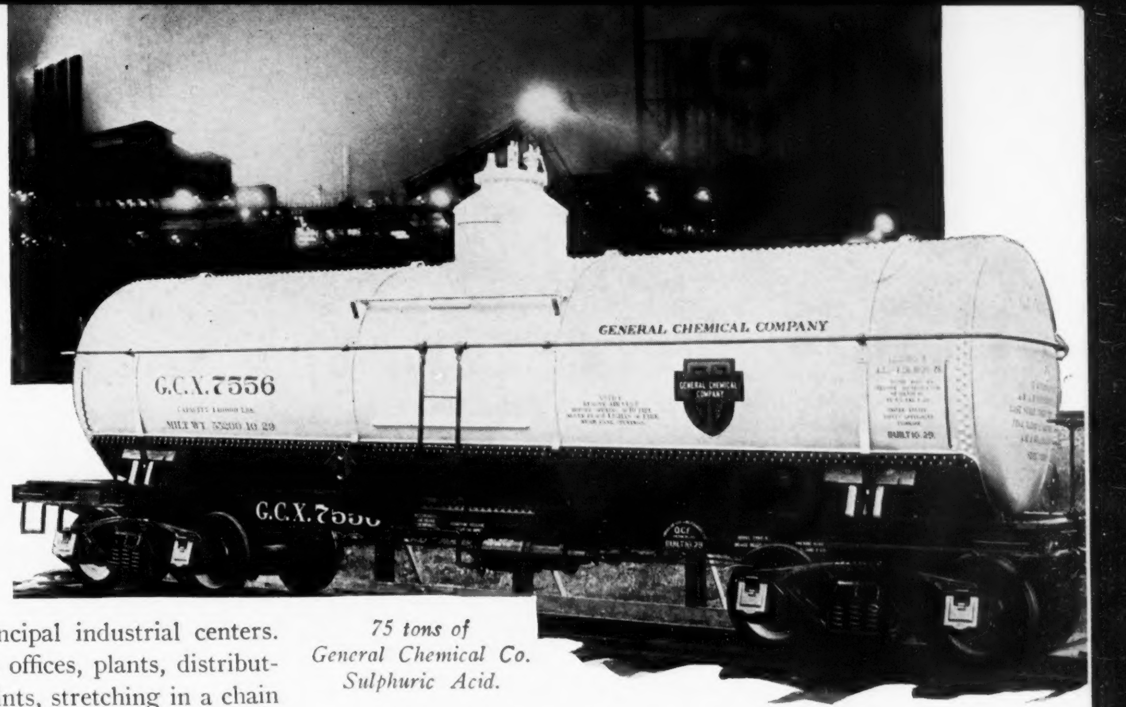


The first acid tank car, in 1873.

The antecedent companies had long ago set a pace in progressiveness. As far back as 1873, the Nichols Chemical Company had conceived the idea of tank-car shipment of sulphuric acid. And the first carload bulk shipment of sulphuric traveled the rails from the Nichols Works in Long Island City, New York, to the Pittsburgh steel-mill district. Prior to that, the glass carboy was the standard and largest unit package handled. Today, the company's tank-car fleet provides bulk carriers for all the strong acids.

Producing both acids and salts in tonnage quantities,

the company pioneered in advocating customer purchases in bulk. Today, its carload shipments are dispatched in numbers daily, its tank-car fleet carries heavy acids to consumers throughout the continent, its lighters and tank barges ply the waters of Chesapeake Bay, the Delaware, the Hudson, the upper reaches of the Ohio, Long Island Sound, and Puget Sound: and its trucks and tank trucks traverse the highways of principal industrial centers.



75 tons of General Chemical Co. Sulphuric Acid.

Likewise, the chain of sales offices, plants, distributing stations and warehouse points, stretching in a chain across the country, enables it to supply the consumer demand when and where it exists, with a maximum of speed and convenience.

While manufacturing and shipping acids, alums, phosphates, sodium salts and the other staples of its heavy chemical line in tonnage lots, General Chemical Company also produces for the half-ounce user of laboratory reagents. Thus, we see mass manufacture and infinite quality refinement engage the attention of the same management.

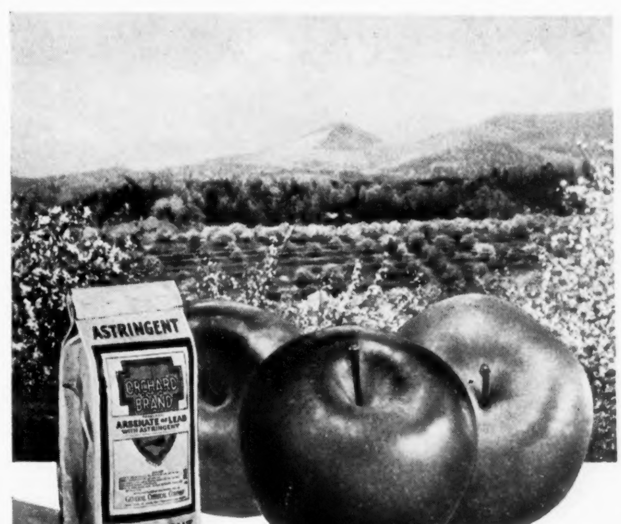
Ounces of Baker & Adamson Laboratory Reagents.

From school days on, the chemists of the land have been familiar with the name of Baker & Adamson on reagent chemicals. Since being brought into the General Chemical picture some 35 years ago, this grand old name has prospered exceedingly. First, to make chemically pure reagents in America, it has carried on to years of enviable service in the laboratories of the land.

Early in its business life, General Chemical Company acquired the Thomsen Chemical Company of Baltimore and all the heritage of brand name and product goodwill which had been built up by that pioneer producer of insecticide and fungicide chemicals for agricultural use. With the intensification of fruit growing and agriculture through the past decades, the hordes of insect pests and spreading disease infections have created an increasing demand. General Chemical has instituted manufacture on the Pacific Coast, and built up its facilities in the East. It is now producing for the requirements of agriculture and horticulture from coast to coast, and from the Gulf to the Canadian border and beyond. General Chemical Company has been the important factor in the manufacture and sale of these arsenical, sulphur, copper, and other compounds for many years; and that it has been a stabilizing influence in the trade is generally recognized.

With its multiple plants and the extremely wide variety of chemical manufacturing equipment therein, it has been natural that the manufacture of quantity lots of special "tailormade" chemicals has gravitated to this company. It will be natural for this business to expand both in the plants equipped for tonnage production and in the fine chemical plants in which the standard laboratory reagents are produced.

Elsewhere in this issue you will find a tabulation of principal chemical commodities and the entry of the General Chemical name under many products to which no specific reference has here been made. A study of the list will confirm what the trade generally appreciates, viz., that General Chemical with its wide spread of products, its chain of plants, distribution stations, and sales offices from one coast to the other, is intimately part and parcel of the business life of American chemical-consuming industries wherever they exist.



From tons of acid for pickling the steel mills' output to insecticides to kill the farmers' orchard pests—directly or indirectly General Chemical Company products touch all American life.

It Took 26 Years To Write this Chapter of One of Chemistry's Romances

Electro Bleaching Gas Co.—Niagara Alkali Co.

ON March 5, 1823, while Michael Faraday was conducting a laboratory experiment with chlorine hydrate in a sealed tube, he received a visit from Dr. J. A. Paris. The latter noted some oily matter in the tube and twitted Faraday for using dirty apparatus. When Faraday started to open the tube it shattered, and the oily matter vanished. Faraday was curious. He studied the accident. On the following morning Dr. Paris received this note—

> "Dear Sir: The oil you noticed yesterday turned out to be Liquid Chlorine. Yours Faithfully, Michael Faraday."

Faraday considered liquid chlorine a laboratory curiosity in 1823—a dangerous maverick with a decidedly vicious temperament. Many years later, however, this bucking broncho of the laboratory was to be harnessed and tamed. Today it is not only one of the most important forces in the chemical world, but in the social and industrial worlds it exerts a tremendous influence, and its uses are continually being expanded.

In order to understand clearly the importance of liquid chlorine and the complicated industry to which its production has given rise in America, let us review briefly the history of chlorine from the beginning.

Chlorine has always offered an exciting challenge to enterprising minds—and for that reason its history is dotted with the names of many of the world's greatest chemists — among them such men as Berthollet, Berzelius, Davy, Faraday, Gay-Lussac, Lavoisier, and Scheele.

Chlorine gas was first prepared by Scheele in 1774, but it remained for Berthollet, in 1785, to be the first to use a chlorine preparation as a bleaching agent. 1935, therefore, not only marks the tercentenary of the American chemical industry, but the sesquicentennial of the first manufacture anywhere of a chlorine bleaching liquid!

Cylinder containing the first pound of liquid chlorine produced in the U. S. A.

In 1789, the year of the inauguration of George Washington as first President of the United States, Berthollett greatly improved "chlorine water" by adding caustic potash, and gave the world its first hypochlorite solution, "Eau de Javelle."

The manufacture of bleaching powder, begun in 1799, revolutionized the bleaching of cotton goods. Up to then, bleaching was done by spreading the goods on grassy fields and allowing the sun to whiten them. With the arrival of bleaching powder, the process became a matter of minutes instead of months. By the year 1800, the English had taken the lead and were well on their way to building the colossal cotton goods business which was to reach every corner of the world.

Northmore first liquefied chlorine gas in 1805; and in 1888 the Badische offered commercial quantities of liquid chlorine. From that date on, liquid chlorine was an article of commerce in Germany. No commercial production was attempted in the United States, however, until 1906. In that year, after many experiments, the first small cylinder (one pound, illustrated here) of liquid chlorine was manufactured by a group of men under the leadership of E. D. Kingsley, who, in 1907, organized and financed the Electro Bleaching Gas Company. In 1909 this concern moved to Niagara Falls adjacent to the plant of the Roberts Chemical Company, who furnished the chlorine gas for liquefaction. The first commercial production of liquid chlorine in U.S.A. was effected in 1909, and on September 22, 1909, the first shipment of six cylinders was made. In 1910 the Roberts Chemical Company was sold to the Niagara Alkali Company, and the chlorine gas produced at the plant in the manufacture of bleaching powder was converted to use by the Electro Bleaching Gas Company for the production of liquid chlorine. Thus began the association that has been continued and strengthened throughout the years. The Electro Bleaching Gas Company acquired the Niagara Alkali Company in 1917, and since then the two organizations have grown steadily under the same banner.

From 1909 onward, liquid chlorine steadily displaced bleaching powder. This change was inevitable, al-

This is the Original Plant of Electro Bleaching Gas Company at Niagara Falls, N.Y.

though for certain purposes bleaching powder still has advantages over its rival. Electro Bleaching Gas Company has pioneered continuously in introducing liquid chlorine into many new fields—textile bleaching in 1909, water sterilization in 1913, paper and pulp bleaching in 1919, and shellac bleaching in 1921.

The present American industry, including the several small chlorine plants at pulp mills, has a daily chlorine gas capacity of nearly 1,000 tons. The greatest proportion of this tonnage is liquefied and distributed to consumers in cylinders and tanks, including 800 tank cars of fifteen, sixteen, and thirty tons capacity.

The demand for liquid chlorine has grown apace. Research is discovering new uses to which it can be applied. When Electro Bleaching Gas Company made the first experiment with the sterilization of water at Niagara Falls in 1913, it opened up a field that has become increasingly important. Today every American community of any size sterilizes its water supply, and hundreds of towns and cities chlorinate their sewage. The chlorination of water supplies assures the consumer against water-borne diseases, such as typhoid, dysentery, and cholera. From coast to coast, chlorination is the standard practice, recognized by the courts and enforced in many places by ordinance. It is as much a part of a water works system as are filtration and piping. The old saying that cleanliness is next to godliness might well be amended to say that chlorination is next to godliness. Wherever disease germs are eliminated from drinking water by sterilization, there is an immediate reduction of disease and great prevention of human suffering, to say nothing of the enormous money saving that increased health brings to the community.

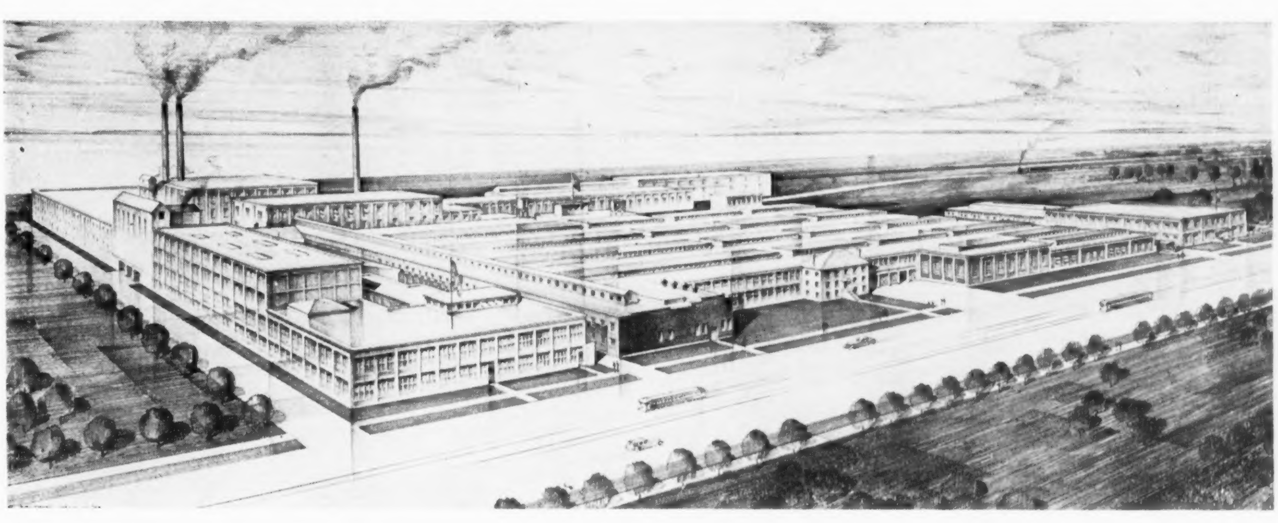
Typhoid and milder water-borne diseases were a scourge in America until the introduction of liquid chlorine into the country's water supply. These diseases have taken the lives of thousands and have spared no class from president to plowboy. They have dogged the steps of every American soldier up to the World War. Because the Civil War was innocent of sanitation, and the Spanish American War nearly so, thousands were slain by water-borne diseases. In the latter war, disease took more than bullets. Had not typhoid inoculation and a chlorinated water supply attended the American soldier in France, many more would have been mowed down by this means during the World War.

Chlorine is consumed in many other ways. Closely allied to the purification of drinking water is the chlorination of sewage, which is practiced on an increasingly large scale. Sewage disposal, in many communities the most important sanitary problem yet to be solved, presents many opportunities for development. The treatment of slimes in paper mills and on the water side of condenser tubes in steam plants is a similar problem that is being solved with chlorine and chlorine compounds.

The World War disclosed that the United States had no organic chemical industry of any importance. America then began to develop an organic chemical industry of the first order and one that is unique in many respects. Chlorine has played a large part in this development. Today, some of the more important products requiring chlorine as a tool or a component are so much a part of our daily lives that we accept them without reflecting on their interesting character and the superb applied science lavished on them.

For instance, no American airplane flies today that does not use gasoline treated with tetraethyl lead. A small quantity of tetraethyl lead is dispersed in a larger quantity of ethylene dibromide and in that manner the tetraethyl lead is added to gasoline. The manufacture of ethylene dibromide requires ample supplies of bromine and that bromine is obtained by using chlorine to displace and capture bromine from natural brines or from sea water. Millions of motor cars use "leaded" gasoline also.

Again, quantities of chlorine are employed in the preparation of ethylene glycol, and that substance is used increasingly in the radiator of the American motor car.



The plant of the Niagara Alkali Company and Electro Bleaching Gas Company, Niagara Falls, N. Y.

The modern Pullman car, the home, the movie, the office, the theatre that are air conditioned with the new refrigerant, dichlorodifluoromethane, are also users of chlorine, as the name suggests.

If one had said a few years ago that a horticulturist growing peach trees would dig a ring around a tree and sprinkle paradichlorobenzene in the ring, he would have raised a skeptical smile. Yet today thousands of tons of this substance are put to this purpose every year. Paradichlorobenzene is one of the Niagara Alkali Company's important products.

The refining of petroleum and petroleum products consumes greater and greater quantities of chlorine. The dyestuff industry, now firmly established in America, is also a user. The two oldest users, bleachers of cotton goods and paper pulp, consume a large proportion of the output. Rayon production demands chlorine as a bleaching agent. Sulphur chloride has its place as a condensing agent for acetic anhydride in the manufacture of acetate yarns.

The chemical manufacturer should ever be mindful of his relation not only to national health, industry, and agriculture but to the national defense. The well integrated commercial manufacture of chlorine is a constant and vital element of the national defense at no expense to the taxpayer.

Niagara Alkali Company, throughout its history, has shown the same pioneering spirit that distinguished the production of liquid chlorine by its affiliate. This company was the first to produce caustic potash (liquid, flake, and solid) in this country; and the first, also, to produce flake caustic soda here. Recently, it pioneered again in being the first American producer of carbonate of potash, which is used so extensively in the manufacture of fine glassware.

When the news of this latter development was announced, it occasioned a great deal of interest among glass manufacturers, for carbonate of potash, formerly obtained only from abroad, is one of the fine-glass makers' most important materials. Potash glass has distinguishing characteristics, namely, a brilliant sparkle and lustre and a fine clear "tone." A qualitative test, known to manufacturers and sellers of fine blown stemware, is to tap the piece lightly. A clear bell-like ring gives evidence that carbonate of potash has been used in its composition. This difference in tone is evident in porcelain and chinaware too, in which carbonate of potash is also extensively used.

Caustic soda, in the manufacture of which Niagara Alkali Company is an important factor, is used in a wide variety of fields—in the production of soap, paper, paint, textiles, water-softening compounds, drugs, and hundreds of other products. It is essential to the rubber industry, to oil refining, cleaning, and some varieties of ore flotation.

Ever since Niagara Alkali Company first introduced the manufacture of caustic potash to this country, it has given the closest attention and the greatest patience to developing the quality of this difficult chemical—until today Niagara's product is famous for its purity and uniformity. Caustic potash is one of the nation's important chemicals, being used in the manufacture of dyes, soaps, chemicals, drugs, storage batteries, and also in ore flotation work.

Much as the tercentenary may do to stir the imagination, it remains for the chemical manufacturer to cherish the records and memories of his own labors and to draw inspiration from the history of those who, in the eighteenth and nineteenth centuries, despite poor apparatus and the indifference of their age, wrought mightily and for all time.

The Electro Bleaching Gas Company and Niagara Alkali Company try to carry on their business in the light of this great chemical tradition and to keep the faith.

This piece of rope is one of the first materials ever to be bleached by liquid chlorine made in this country, and was used to demonstrate to textile mills the efficacy of this new bleaching agent.

From Spices to Sodium Silicate

The Growth of Mechling Bros. Chemical Company

Above, the Camden plant which became a part of the Mechling Company in 1902.

The Boston plant, manufacturing silicate of soda.

JUST after the close of the Civil War two Mechling brothers, William Harrison Mechling and Benjamin Franklin Mechling, went to Philadelphia after graduating from what is now Muhlenberg College. Their father had a farm but the Mechling brothers established themselves at 124 Arch Street because "they were too strong to work on the farm." Their trade was jobbing, their products spices, teas and drugs. By 1874 they had moved to 153 N. 3rd Street and the enterprise included the jobbing of chemicals, particularly lye. Then followed moves to 130 N. 2nd Street in 1882, where the firm became known as Mechling Bros. & Co., and 949 N. 9th Street in 1892 where they started the manufacture and packaging of lye in small cans under their own brand.

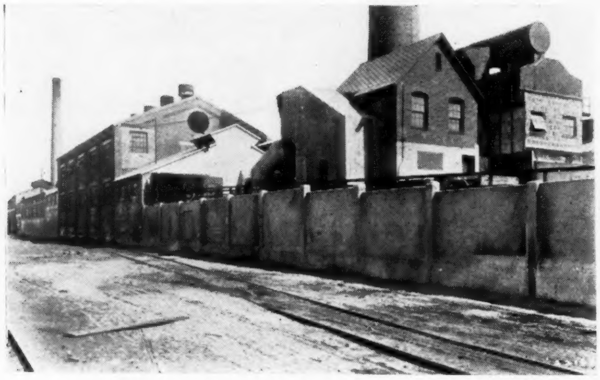
It was at this point that a second generation entered the company. The present president, B. S. Mechling, decided to embark in the chemical business, and while taking courses in chemistry at Drexel Institute and University of Pennsylvania he joined his father and uncle. He purchased the Camden plant in 1902 to manufacture epsom salts, silicate of soda, hyposulphate of soda. The lime-sulphur solution was manufactured because of the ready market in the adjacent fruit growing sections of New Jersey.

The Boston plant at Medford, Massachusetts, was built in 1920 for the manufacture of silicate of soda, and to use as a warehouse in New England for the Camden plant. About this same time a full line of insecticides was developed for the small package consumer. Regular retail channels were used, and such products as Pyrote, Sulforote, and Japtox were developed.

Today the manufacture of heavy chemicals is the main business of Mechling Bros. Chemical Company. Their major product is silicate of soda.

General policies which have governed the company have stressed the manufacture of quality products at fair prices and developing the normal uses of these products in their industrial fields.

B. S. Mechling is a member of the Board of Trustees of the Manufacturing Chemists' Association and formerly Chairman of the Silicate of Soda Institute of which he was one of the founders.



Pursuit of Precious Metals

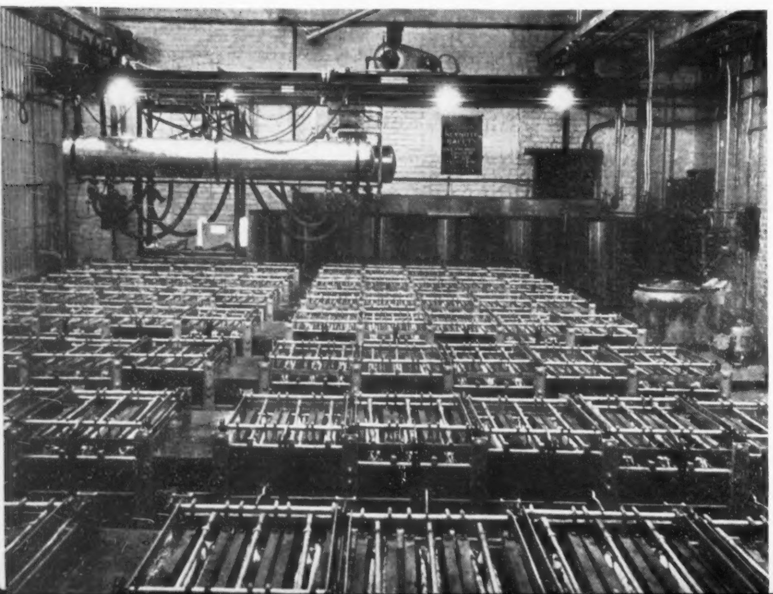
At the Unique Plant of The Irvington Smelting & Refining Works

THE precious metals—gold, silver, and the members of the platinum family—generally occur in small quantities with other metals and are concentrated in the course of the metallurgical process. They find their way, too, into industrial wastes: jewelers' sweeps, photographic films, used platinum catalysts, and so on.

When these primary concentrates or secondary wastes reach a certain richness, the recovery of their precious metals becomes the business of a plant which is equipped to operate with a minimum of losses. The Irvington Smelting & Refining Works has done this recovering for the last sixty years. Amounts of gold handled annually have risen from $1,250,000, thirty years ago, to $20,000,000—silver from a million ounces to twenty million ounces. As a sideline, the treating of the copper with which many of the precious metals are associated has made Irvington the second largest producer of copper sulfate on the Atlantic Coast; and the process has the advantage that the copper sulfate produced is of high purity.

Irvington is closely affiliated with Baker & Company, of Newark, New Jersey, the largest platinum refiners in the world; and for this reason Irvington is especially fitted to recover all the platinum metals, even in minute quantities, in all lots of waste materials or ores.

Part of Irvington's new electrolytic silver plant.



A plant which is small in comparison with a plant handling crude ores provides the flexibility necessary to give individual treatment to each specific case. Every mixture of metal-bearing wastes is a new problem and must be processed with regard for the proportion of each metal present, and the chemical state.

As Irvington's business has increased, the necessary inventions have been made to permit the installation of automatic processes whenever the economics of the situation called for them. The result is that hand control has been largely replaced; and the present-day plant contains a great many mechanical refinements especially designed to cope with the various and difficult problems of recovering even minute traces of gold and silver as well as all the metals of the platinum group.

The new silver plant, which has increased the silver capacity from 700,000 ounces per month to 4,500,000, is a splendid example of up-to-date installation. Air coming in from the outside is filtered to keep dust away from the baths, and the greatest cleanliness is maintained throughout so as to give maximum purity of product.

Many technical and scientific improvements have made possible the economic working of wastes which could not have been used a few years ago; and further improvements are constantly being made in methods of handling the most valuable materials worked by this highly specialized company.

The plant is located in Irvington, New Jersey. The company president, Charles Engelhard, finds time from his many other interests to exercise direct supervision of the business. Frederick Coester, the company secretary, is also active in the management. Technical improvements have been made under the direction of E. L. Jorgensen, plant superintendent.

Intermediates that Grew into Dyes and Pharmaceuticals

The Calco Chemical Company, a Division of American Cyanamid

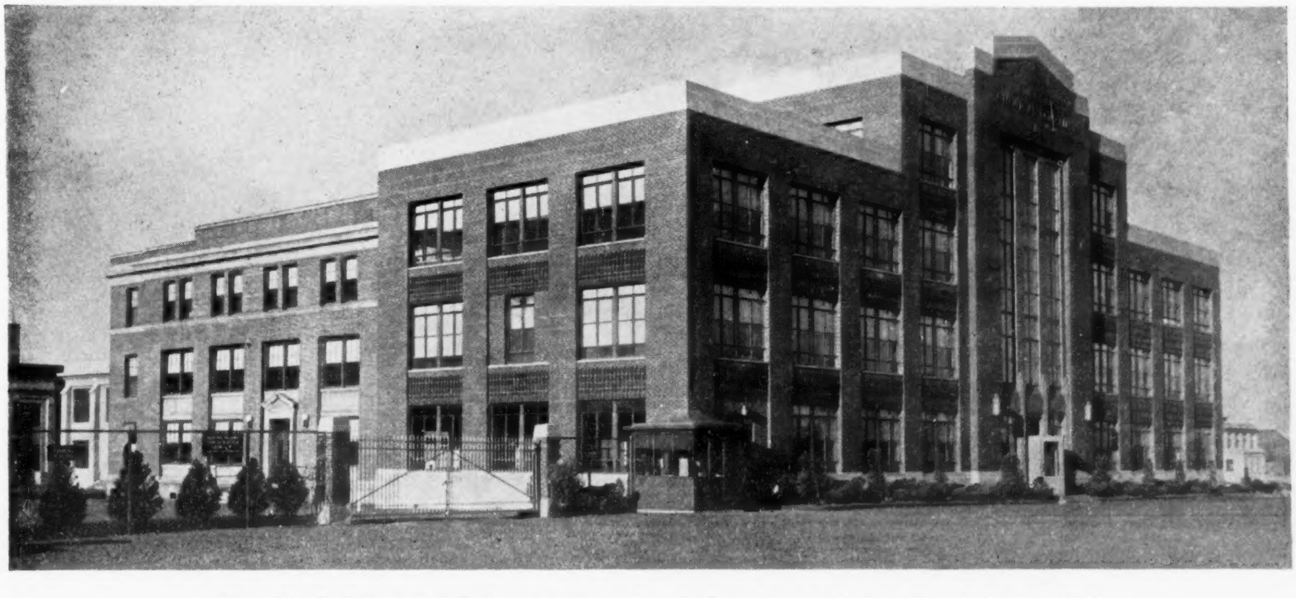
THE Calco Chemical Company had its genesis in a dye-using textile company, The Cott-a-lap Company (founded in 1900 in New Haven, Conn.), which moved to Somerville, New Jersey, in 1909, due to the growth of its business and the importance of being located near its center of consumption. It specialized in wall coverings made from jute cloth manufactured in Scotland and colored with dyes imported from Germany. The war caused the British government to commandeer all jute cloth for sand bags and the German government to stop shipments of dyestuffs or intermediates to this country. The chemical, engineering, and operating ability of the Cott-a-lap personnel and its familiarity with dyes and dyeing operations rendered it particularly suitable to enter into the field of intermediates. Calco was started to manufacture one of the intermediates which it used and had difficulty in obtaining, and which had increased in price from 15 cents to $3.00 per pound.

In the spring of 1915 the Calco Chemical Company was organized and commenced building a plant in Bound Brook, New Jersey, a site chosen because it would have sidings on two railroads. The name "Calco" was coined from the initials of the parent C-A-L Co. The first product was to be beta naphthol; but as the apparatus for manufacturing aniline oil and nitrobenzene arrived first, and were more workable, these were the first products produced, and are still produced by Calco on a very large scale.

Because the first complete plant (apparatus) purchased from the makers proved unworkable and valueless, early in 1916 work was started on the construction of a new plant of Calco design, to manufacture beta naphthol, a derivative of naphthalene which is the starting point for a wide and varied list of azo dyes used extensively in all branches of color-consuming industries. In spite of difficulties in obtaining equipment, not only because the tools had to be made especially for the job, but also because manufacturing and shipping conditions were in a turmoil as a result of the war, completion and production were pushed almost regardless of cost; and by the end of 1916 Calco was the largest American manufacturer of beta naphthol.

The next important intermediate to be added was dimethylaniline, a derivative of aniline oil and methyl alcohol. This intermediate is essential to the manufacture of certain so-called "basic" dyes that are used in dyeing and printing cotton and silk and for coloring paper, etc.

Between the Allies blockading German ports and



The office building of Calco's extensive and recently enlarged plant at Bound Brook, N. J.

Germany's efforts to bring the world to terms by cutting off their dyestuff and drug supplies, there had resulted a world shortage of intermediates and dyes. This resulted in a tremendous demand from other countries, even in Europe, for Calco's products. The prices were very high both on raw materials and finished goods, and costs as measured by present values were out of sight; but the demand continued to be so great that the company was able to extend its operations. During the war the company was called upon to develop production methods and build plant for a new much-needed explosive, so important that before the armistice one-half of our army's ammunition was planned to use this booster charge.

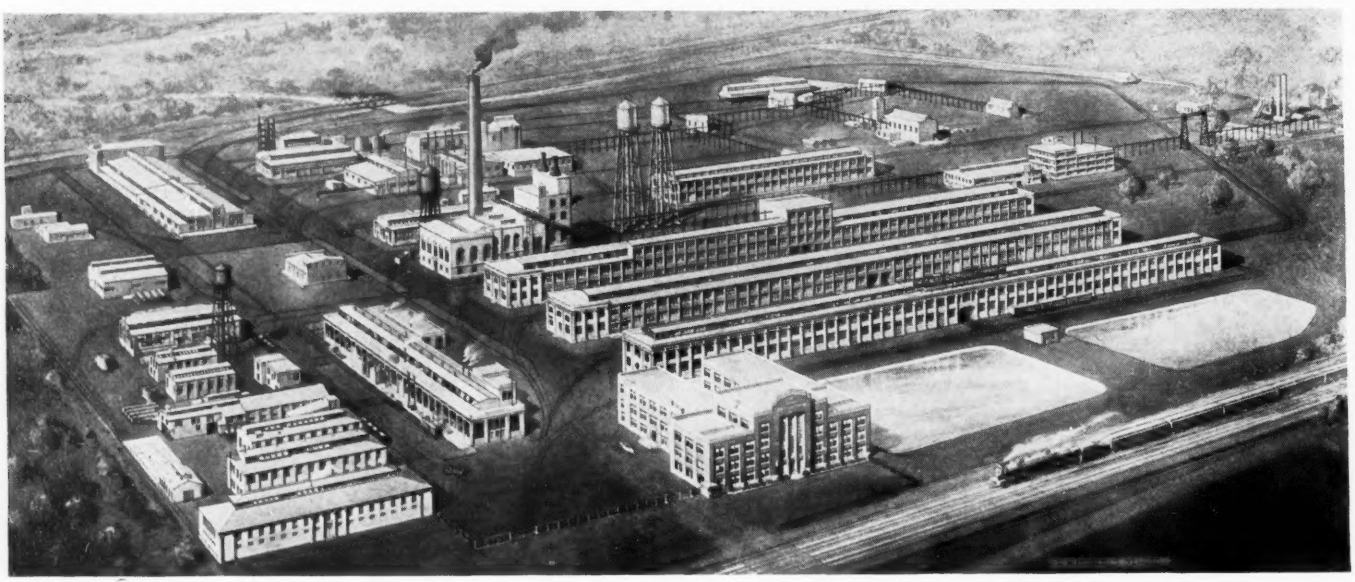
The signing of the armistice was followed by a sudden halt to all branches of business, and the new chemical industry was no exception. It was beginning to be evident that the industry here would not support a business devoted to intermediates, so the company was forced into dyestuff manufacture. Calco entered the dyestuff field through the production of a limited number of azo and basic dyes. The middle of 1920 found the company with more than six hundred employees and an annual business of some millions of dollars, divided among fifteen intermediates and thirty finished dyestuffs.

The fall of 1920, however, brought a sudden postwar deflation and wholesale cancellation of contracts by domestic and foreign buyers. The bottom dropped out of all commodity markets. Aniline oil, for example, slipped from a high of 60 cents per pound (1919) to a low of 16 cents at the end of 1920. Many concerns which had thrived under the war and early post-war conditions faded as rapidly as they had bloomed and quickly passed out of existence. At the peak there were more than eighty companies in the United States engaged in manufacturing intermediates or dyestuffs or both. Some of the larger of these companies had started with a program of manufacturing a wide range of dyes, and gradually made their own intermediates. Most of the smaller companies purchased their intermediates from others, such as Calco, and converted them into finished colors. A very substantial proportion of Calco's business was with the small dyestuff producers. The depression was at its worst in 1921, but the years that followed were not as good for the chemical as for other industries. The export business dropped to practically nothing, and prices sagged to less than cost on most products in the domestic market. There were wholesale failures throughout the dyestuff industry; and it was evident that only those concerns which had built up large reserves could survive the bitter struggle for existence that marked the years 1921 through 1924. Calco suffered because so much of its business was done with the smaller manufacturers.

It soon became obvious that if Calco was to retain a market for intermediates which it had developed, it must go further into the business of finished colors. There were two courses open. Either Calco must itself set up dyestuff manufacturing processes which would duplicate the work which had already been done by the other manufacturers, or it could buy the businesses of a number of these manufacturers, with their existing plant, personnel, and processes. The former course meant extensive research programs which, by their very nature, would entail great delays as well as high expense. The latter course had the added merit of bringing to Calco personnel which had had an opportunity to gain experience in this field, so new to America.

Accordingly, it was decided that Calco should acquire and develop some of the already established dyestuffs manufacturing businesses. Such acquisitions were made both before and since Calco became a Division of the American Cyanamid Company in 1928. Included were the following manufacturers of dyestuffs:

Granton Chemical Co., New Brunswick, N. J.
Marietta Refining Co., Marietta, O.
Williamsburg Chemical Co., Brooklyn, N. Y.
Essex Aniline Works, Essex, Mass.



The Bound Brook plant, on the outskirts of the metropolitan area.

Textile Chemical Co., Providence, R. I.
King Chemical Co., Somerville, N. J.
Crown Chemical Co., Matawan, N. J.
Gaskill Chemical Co., Newark, N. J.
May Chemical Co., Newark, N. J.
Passaic Color Co., Passaic, N. J.
Beaver Chemical Co., Damascus, Va.
Wetterwald & Pfister Co., New York, N. Y.
Dye Products & Chemical, Newark, N. J.
Trico Chemical Co., Buffalo, N. Y.
National Ultramarine Co., Cincinnati, O.
Heller & Merz Co., Newark, N. J.

An application laboratory, where chemists determine the best ways of using Calco products.

This last was the largest and most important of the acquisitions, because it brought to Calco one of the oldest, finest, and strongest American manufacturers of dyestuffs, specializing in a wide range of products for the paper trade. In addition, Heller & Merz had been the pioneer in the manufacture of ultramarine blue in this country.

Shortly after Calco acquired Heller & Merz, American Cyanamid Company purchased the business of A. Klipstein & Company, large dealers in chemical supplies and dyestuffs. The chemical departments of A. Klipstein were absorbed by Cyanamid, and the dyestuff department was taken over by Calco. Within the last two years, Calco has absorbed the following: Noil Chemical & Color Works, New York, New York; Kent Color Co., Brooklyn, New York; E. C. Klipstein & Sons Co., Charleston, West Virginia.

The result of this policy has been not only to increase the volume of sales and manufacture but also to expand the list of manufactured items from approximately fifty in 1920 to nearly five hundred at the present time, and bring it into the field of all color-consuming industries. The range in products covers nearly all of the important classes of dyestuffs, so that today Calco is in position to render complete service to all users of color. The company has established branches with complete laboratory and warehouse facilities for servicing its customers in the principal dye-consuming territories. These are located in Boston, Providence, Philadelphia, Chicago, and Charlotte, N. C. It also maintains stocks and technical service on the Pacific Coast.

The rounding out of the dyestuff line has made it possible for Calco to enter some of the world markets, and it has therefore established agencies in Canada, Mexico, Brazil, India, and China. The devaluation of the dollar has of course stimulated the introduction of Calco colors in these countries.

The manufacture of intermediates and dyestuffs is very closely related to the production of pharmaceuticals of organic origin. Calco has devoted a great deal of laboratory and clinical research to this field, and it is a matter of interest to record that Calco was the first (1916) to produce in the United States the important drug Cinchophen, when patients were suffering from the sudden cut-off of the German supply. Calco has placed on the market a line of new and original medicinals created in its own laboratories.

The company has its main office and principal works at Bound Brook, New Jersey. It has branch factories

An alcove in the research laboratories.

in Newark, New Jersey, Damascus, Virginia, and South Charleston, West Virginia. The other outlying plants have been transferred to Bound Brook, where manufacturing, transportation, and residential conditions are ideal for a business of this type. The Calco property consists of about five hundred acres of land, most of which are located between two important railroads, the Central of New Jersey (Baltimore & Ohio system) on the north and the Lehigh Valley on the south. As Bound Brook is only thirty miles from New York, the company is in splendid position to service its customers in the metropolitan district, as well as the New England and Philadelphia territories, by truck shipments. The plant has fifty manufacturing buildings, warehouses, and laboratories, employing over two thousand people, representing an expenditure of over twenty million dollars. Calco manufactures a great many of its basic materials including mineral acids: sulphuric, nitric, and hydrochloric. It also refines its own supplies of naphthalene and the coal-tar distillates, benzol, toluol, and xylol. It is evident that the company is in a fundamentally strong position to compete for its share of business, present and future.

Fine Chemicals from Oil

The Successful Evolution of the Pennsylvania Coal Products Company

DURING the war period there was a large demand for the products of the by-product coke ovens. But few of these ovens were in existence, so that the chemicals produced by them commanded interesting prices. Most coke in the United States at that time was produced by the old beehive type ovens. With the increased demand for benzol and toluol (both coke by-products) additional methods for producing them were investigated, and the Rittman Process for the manufacture of benzol and toluol from oil distillates was adopted.

The Pennsylvania Coal Products Company was incorporated in 1916 with a capital of $250,000. Its plant and office are located in Petrolia, Butler County, Pennsylvania.

The plant site of five acres is located in the petroleum oil fields where, in addition to oil, there is an abundance of coal and natural gas. In the immediate vicinity are petroleum refineries where oil distillates are available in large quantities. A substantial plant was erected; but before production began, hostilities ceased, and the demand for toluol and benzol materially changed. With the increasing production of these crude chemicals, occasioned by a greater number of by-product coke ovens, the initial purpose was abandoned.

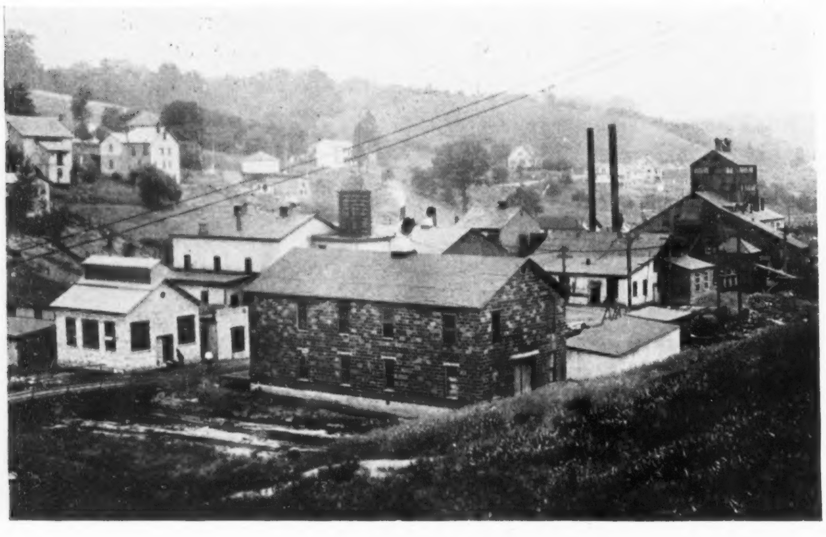
At this time (1919) the present management joined the company, reconstructed the plant, and entered into the production of fine organic chemicals—specializing in phenols, and producing now, in commercial quantities, resorcin, pyrocatechol, and phloroglucinol.

Resorcin was the first phenol produced, with a daily production of 500 pounds of both technical and pharmaceutical grades. This output was rapidly increased to meet the entire domestic need, both in the pharmaceutical and the dye industries. In addition to the needs of the leather, printing-ink, color-lake, and resin industries, much has been done to develop new uses for this chemical. Resorcin, in 1919, sold for $3.25 per pound. In 1935 the price is 75c per pound for large quantities.

Pyrocatechol, recently selling for $10 per pound, was restricted in use. The present price is $2.40 per pound, thus encouraging many new developments and creating at a reasonable price to the consumer products not otherwise available. The industries most interested in the progressive development of this chemical, such as manufacturers of medicine, dyes, petroleum, paint, and photography, can reasonably expect further reductions in price as consumption increases.

Phloroglucinol sold for $110 to $125 per pound prior to the company entering its manufacture. A chemically pure product is now sold at $25 per pound, and a technical product at $15. Heretofore, domestic consumers were at the mercy of foreign producers; but they now have a dependable American supply for their entire needs. The use of this chemical in blue prints creates long sought-for effects. Phloroglucinol as a developer results in a white field and black line.

The Pennsylvania Coal Products Company's facilities have been used by many large companies for the production of new and special chemicals to be used by the varnish and rubber industries, as well as for the control of termites. The company's business is transacted at its office at the works, where ample stocks of all materials produced are maintained, affording prompt, efficient service to its clientele.



Plant at Petrolia, near the sources of the crude petroleum it transforms into useful chemicals.

Turning Waste Materials into Chemical Wealth

Henry Bower, chemical pioneer.

HENRY BOWER, his sons, grandsons, and their associates, have been engaged in the business of manufacturing and selling chemicals for seventy-six years, more than one-quarter of the entire life of the chemical industry in the United States. It is particularly interesting to record that the principal pioneering achievements made by Mr. Bower, and their development by his succeeding companies, were based on the utilization of waste materials; the conversion of them into products that provided not only a source of substantial revenue to the producers of the raw and finished materials but also contributed largely to the successful progress of the industries closely allied with these developments.

In 1858 a portion of the present factory site in Philadelphia was rented by Mr. Bower for $15 per month from Joseph Pickering for the purpose of manufacturing sulphate of ammonia from the ammoniacal liquors of the Philadelphia Gas Works, then running to waste. In 1866 he made a "complete manure containing superphosphate of lime, ammonia and potash." The introduction of such a mixed fertilizer in this country was a pioneering achievement.

Prior to this, in about 1852, Mr. Bower while working as a drug clerk had become impressed with the fact that this country did not have a supply of good quality refined glycerine. The only glycerine they had at that time was apparently a "fetid preparation, the result of decomposing olive oil in making lead plaster, and the cost per pound was from four to five dollars, its use of course being restricted by its quality and exorbitant price."

Mr. Bower discovered that thousands of pounds of crude glycerine were running into the rivers and sewers of New York, Philadelphia, Cincinnati, St. Louis and Louisville as waste from the stearine candle works. In 1858 he set to work to experiment in purifying this crude glycerine and after long and weary efforts succeeded, in about the middle of 1860, in producing and placing on the market a "pure inodorous glycerine." It is believed that this was the first highly refined glycerine made in the United States and that the present industry can truly be said to be the outgrowth of Mr. Bower's pioneering. In 1878 he received the Elliott Cresson Medal from the Franklin Institute in recognition of being the first manufacturer of pure inodorous glycerine in the United States.

In 1867 the manufacture of yellow prussiate of potash was started, using potash recovered from leached wood ashes; the cyanogen for this ferrocyanide was obtained from animal scrap such as leather clippings from shoe factories, waste cattle hoofs and horns, and waste horns from factories using cattle horns for the manufacture of horn backings, buttons and so-called jewelry. This process was the origin of the long association the name of Bower has had with the prussiate industry in the United States.

In 1880 and 1882 Mr. Bower recovered cyanogen

A photograph of Henry Bower's plant force taken fifteen years before the Gay Nineties began.

from the distillation of coal at the Philadelphia Gas Works and made yellow prussiate of soda in a small way. The present process using cyanogen recovered from the distillation of coal is a direct improvement of the original cyanogen recovery.

In 1882, thirty-two years after Isaac Tyson first produced bichromate of potash in Baltimore, Mr. Bower, in partnership with the Harrison Brothers of Philadelphia, established the Kalion Chemical Company to manufacture bichromate of potash. This was the second plant of its kind in the United States. In 1902 the Kalion Chemical Company acquired the Baltimore Chrome Works from Jesse Tyson. In 1906 the Kalion Chemical Company was absorbed by the Henry Bower Chemical Manufacturing Company which in turn, in 1908, disposed of Tyson's original Baltimore plant to the Mutual Chemical Company of America. Thus in the bichromate industry Mr. Bower was associated with the pioneering efforts in this country.

In 1893 Mr. Bower started a process for the recovery of tin in the form of tetrachloride of tin by treating waste tin clippings with chlorine. This is believed to have been the first plant of its kind in the United States.

In 1890 the same raw materials that had heretofore been used in the manufacture of sulphate of ammonia were refined into aqua ammonia. Bower Brand anhydrous ammonia made its appearance in 1903, seven years after Mr. Bower's death. "Bower Brand" is known the world over and in company with other leading American brands, has established a reputation for its high standard of purity.

An improved process for the manufacture of iron blues from yellow prussiate of soda was developed by the company during the last war when supplies of potash from Germany were shut off. The development of this process put at the disposal of the company's customers has been largely responsible for the high quality and the many marked improvements that have been made in the manufacture of blues and greens in the United States.

The present-day force, which works with better equipment but with the old idea—to make valuable chemicals out of raw materials and wastes.

Applied Chemical Knowledge

THE American Chemical Products Company started by focusing a knowledge of organic chemistry upon a particular American chemical need. As the needs of industry changed, the company activities were altered to meet the new demands; and gradually a background of experience has been built up which puts the company in a strong position today as a manufacturer of synthetic organic chemicals.

About June, 1919, the company first became interested in the manufacture of bacteriological stains and dyes to meet the demand of clinical and research laboratories whose supply of these products, formerly imported from Germany, had been cut off. Not only was it necessary to make the dyestuff or other organic compound; the formula for applying it also had to be sought in the literature, or worked out. The company finally collected something like a thousand formulas.

The stains and dyes produced were offered in bulk to the dealer and jobber, who subdivided them into smaller units and put them out under his own label.

When others began to manufacture biological stains and entered the direct selling field the company sold the biological stain business to Biosol Products, and turned its major attention to making reagent and research chemicals, to be disposed of through the dealer and the jobber contacts already established.

In the course of the first ten years in the new field the company prepared more than four hundred synthetic chemical products, many of them taken up because of the promise of technical application for large amounts.

As the company gradually added to its list, the interest in preparing further new products decreased and more effort was spent on searching for new uses for the products the company was already making. Continued research was carried on, however, to learn how to reduce costs.

In 1920 the manufacture of capryl alcohol was taken up. By the best process then available a yellow-colored product with a quite disagreeable odor was produced, and sold for $16 a pound. After considerable experimentation the company worked out a process for the large-scale-production of water-white capryl alcohol, having a clean, mild odor, and selling for a fraction of the old price.

A by-product of this process was sebacic acid, sold in 1919 for about $30 a pound. Today American Chemical Products makes a good technical quality of sebacic acid on a tonnage basis at a hundredth of the old price. As a plasticizing agent and as a new reagent for making already well-established resins, cosmetics, and other products, sebacic acid develops useful new qualities in the materials treated.

Chlorinated paraffins were developed as to both manufacture and uses. The company has now arranged with the Hooker Electrochemical Company for the commercial manufacture on an extensive scale. A similar development took place with acetamide, added to the list in 1920. For several years the company supplied practically all the requirements of the country, and engineered a new process of manufacture having a low production cost. In 1934 arrangements were made whereby the Hooker Electrochemical Company produces acetamide on a large scale. American Chemical Products are now the exclusive Hooker sales agents for both chlorinated paraffins and acetamide.

The company's first operations in 1919 were carried on in a small brick building of about 500 feet floor space and about as much outdoor space. A few years later the company moved into a building with about 5,000 feet of space. In 1935 the third expansion took place when the company purchased and moved into its new plant on Rockwood Street, Rochester, New York. This plant, on a one-acre plot, consists of two cement block buildings with a total floor space of 10,000 feet. A private siding of the New York Central runs between the tank building and main building, with a loading platform running the length of the latter building.

At the new location the company has about 85,000 gallons of tank storage capacity, and expects that its new facilities will enable it to produce some of its chemicals more economically and on a larger scale than has previously been practicable.

The company's efforts for the past fifteen years have been in two chief directions: learning how to make new products, working out processes for new products and developing methods to reduce process costs. A great deal of research has been carried on by and under the direct supervision of the company president, Samuel J. Cohen. Many reactions have been worked out, some of which have resulted in commercially feasible processes, some of which have had to be scrapped. All, however, have gradually built up an unique store of chemical knowledge and industrial experience; and the company looks forward to a future in which the emphasis will be put more and more on intensive development of the chemicals in which it has already done the pioneering work.

Additional synthetic organic products are even now being put into the commercial-production stage—new synthetic chemicals of which no public announcement has yet been made but which are now ready to graduate in their turn from test tube to tank car.

Wishnick-Tumpeer's 15th Anniversary

How a Jobbing Firm Became a Manufacturer of Quality Chemicals

WHILE fifteen years doesn't seem a long time, compared with the 300 years of American chemistry, nevertheless the last fifteen years have been packed with a wealth of experience, for in this period the industry has enjoyed the greatest expansion in its history.

The amazing rise of American chemical enterprise since the war is a matter of record. So rapid has it been that the country is only now awakening to the full significance of its growth. The Tercentenary will do much to present the industry in its proper perspective. Already out of the "growing pains" stage, industrial chemistry in America is establishing itself as the basis for progress and expansion in a wider and wider variety of fields. The young organizations that have grown up since the war have played and are playing an important rôle in this development. Many of these youthful firms are showing the same pioneering spirit that characterized the founders of the industry.

Among those who have appeared on the chemical horizon in the short span of a decade and a half is the firm of Wishnick-Tumpeer, Inc.

Beginning modestly in 1920, with a single office in Chicago, and a total personnel of 4 people, Witco "took off" as sales agents and jobbers for chemical products. By following a policy of thorough and constructive cooperation with those whom it served and gradually expanding its facilities until it has become a direct factor in the production of a considerable proportion of the materials it handles, Witco has risen to a leading position in the chemical world. Its growth has been based on rigid adherence to quality standards, backed by a strict system of testing and retesting, careful analysis and control over production.

As a part of the Witco program of expanding its manufacturing facilities, the firm acquired in 1924 the Pioneer Asphalt Company, whose plant is located at Lawrenceville, Illinois. This firm has been known for more than thirty years for the excellence of its production of mineral rubber and other chemical specialties.

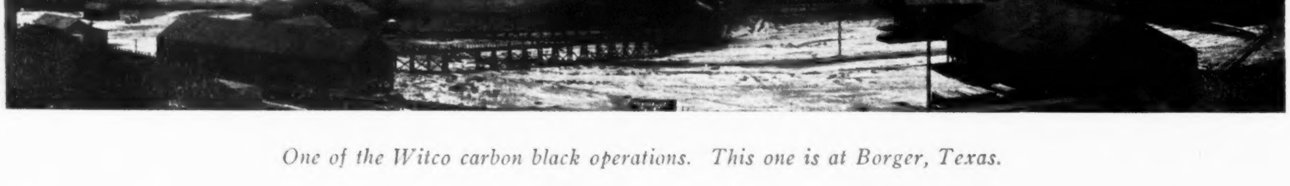
In 1928 the Century Carbon Company, manufacturers of carbon black, became a part of the Witco group. In 1933 the Panhandle Carbon Company, an excellently equipped carbon black plant located at Borger, Texas, was acquired. These additions enabled the company to increase its capacity and further expand its service. In order to be in close contact with consuming centers, offices were established in New York, Chicago, Cleveland and Boston.

Now, Witco activities extend to England. The office of Witco, Ltd., has recently been opened in London to take care of the company's European business.

One of the distinguished developments of Witco is Disperso Carbon Black, which greatly improved the quality of carbon black production. This was made possible by a new and patented process which removed the air or "fluff" and resulted in a superior product for the rubber, paint, and ink industries. The introduction of Disperso Carbon Black is typical of Witco enterprise. More recently the company has added a dustless black to complete its line.

The Witco policy of constantly improving its products has resulted in many developments that affect favorably the production and purchasing departments of the industries served. Enlargement of its facilities, the location of offices at strategic points, and the development of superior methods and materials are responsible for the Witco reputation today.

Witco takes pride in its steady growth and looks forward to expanding its facilities to meet the ever-increasing demands of American industry for chemicals.



One of the Witco carbon black operations. This one is at Borger, Texas.

Left, general offices of Verona Chemical, 26 Verona Avenue, Newark, N. J. Below, a view of the plant.

Coal-tar Synthetics

THE Verona Chemical Company was incorporated in January, 1902, and about a year later manufactured its first product, saccharine, using imported ortho-toluolsulfamid and permanganate of potash. In those early days products like ortho-toluolsulfamid were not obtainable in this country.

The company began doing research on other organic products; and the next chemical to be added to the company list was vanillin, when the chief chemist, Dr. Adolph Wack, discovered a process by which the yield of vanillin ordinarily obtained at the time was considerably increased. The new process was patented both in this country and in Europe, and was soon adopted by the largest European producer of vanillin.

The next project was the distillation of essential oils—clove, patchouli, sandalwood (both East Indian and West Indian), nutmeg, and pimento berries; but this enterprise was given up a year or two later on account of sales difficulties.

Undiscouraged, however, the company branched out into new fields and began making potash chrome alum, terpin hydrate (U. S. P. crystals and powder). Shortly after, the manufacturing department was expanded to include thymol crystals, made from ajowan seed grown in India, at that time the usual raw material used in making thymol. For a number of years the company was the sole American producer of all of these products.

In 1913 the company entered into a contract which indirectly changed the entire company policy. An arrangement was made with Dr. B. J. Flursheim, of Fleet, England, for the sole American rights to tetranitraniline, of which Dr. Flursheim was the inventor. This product was taken over too late for a new and unknown military explosive to be introduced in this country; and all the company efforts, even with the help of Dr. Flursheim, came to nothing. In making tetranitraniline it was first necessary, however, to make dinitrobenzol and metanitraniline, for both of which products Verona soon found there was an immense sale. The company concentrated on them and gave up some of the old products altogether—terpin hydrate, thymol, and the essential oils. Vanillin and chrome alum, however, were retained.

Since the vanillin required sulfanilic acid, no longer available from abroad, the company took up its manufacture also; and this was only the starting point for a number of other intermediate coal-tar products. The company believes itself to be the first American manufacturer of a number of these: orthoamidophenol, dinitrochlor-benzol, metanitraniline, metanitroparacresol, orthoaminometacresol, orthonitrosometacresol, parachlororthonitraniline, etc.

The manufacture of these intermediates required a large amount of research, which was carried out in the company laboratory under the able direction of Dr. J. Ehrlich, chief chemist. The coal-tar synthetic processes were not found in the literature to any extent; and the reactions which were found were, in many cases, suitable for laboratory purposes but not at all suitable for commercial production. Competition as to both price and quality had to be met, and in many cases entirely new syntheses had to be worked out in order for the company to maintain its jealously-guarded reputation for purity of product.

A partial list of the patents granted to the firm gives some idea of the kind of work the company has done. The following are among the U. S. patents:

No. 898,942, September 15, 1908—Process of making aromatic carbonyl derivatives.

No. 898,943, September 15, 1908—Process of making camphor.

No. 1,502,849, July 29, 1924—Process for the production of nitrosometacresol and its application to the separation of metacresol and paracresol.

No. 1,550,064, August 18, 1925—Explosive.

No. 1,610,270, December 14, 1926—Oil solvent process.

No. 1,787,036, December 30, 1930—Propenyl derivatives of aromatic hydrocarbons.

No. 1,801,416, April 21, 1931—Aldehydes from propenyl derivatives of aromatic hydrocarbons.

No. 1,945,270, January 30, 1934—Purification of Cincophen and its salts.

Today the Verona Chemical Company, located in Newark, New Jersey, is principally a maker of organic chemicals, specializing in intermediates. An extensive, well-trained research staff is quietly adding to the list of products manufactured.

U. S. I. Pioneers Domestic Supply of Unusual Alcohol Derivatives

New Products in Beta Keto Compound Group Available in Quantities at Low Cost. U. S. I. Now Largest Producer.

MANY truly important contributions to industry and science have been made during the past decade by the U. S. Industrial Chemical Co., Inc. Of particular significance in the field of American chemistry, these pioneering developments of U. S. I. have provided, for the first time an adequate domestic supply of unusual chemicals, several of which heretofore have been available only from foreign countries in small quantities and at high cost.

In the short span of twenty years, research and development have won for the U. S. Industrial Chemical Co., Inc., the enviable position of being the largest producer of alcohol derived chemicals. As such, U. S. I. is proud to be numbered among the important chemical manufacturers and is continuing its efforts in establishing the dominance and leadership of American-produced raw materials.

The primary raw material in the manufacture of the U. S. Industrial Chemical Co., Inc., products is ethyl alcohol of which approximately 5,000,000 gallons are supplied annually by the parent organization, the U. S. Industrial Alcohol Co. Ethyl alcohol as produced by U. S. I. is obtained by the fermentation of carbohydrates, principally cane sugar in the form of blackstrap molasses. In the distillation of ethyl alcohol a small amount of fusel oil is recovered which is composed principally of active amyl and iso-amyl alcohols. Carbon dioxide gas is also obtained as a by-product of fermentation. Potash salts in crude form are reclaimed from the "slop." Such potash compounds find extensive use as fertilizer ingredients.

A recently published booklet, *Products of U. S. I.*, lists 52 different chemicals produced or handled by the U. S. Industrial Chemical Co., Inc. The majority of these products, such as amyl and butyl alcohols; amyl, butyl and ethyl acetates; diamyl, dibutyl and diethyl phthalates; ether, nitrocellulose solutions, etc., are already widely known and require no further reference except to mention that continued research has resulted in lowering their cost and steadily improving their quality.

Three of the important developments of U. S. I. products have come within a group of chemicals generically known as beta keto compounds. These products are ethyl acetoacetate, acetoacetanilid and sodium ethyl oxalacetate. While these three products cannot be strictly classed as "new," they mark definite progress in American chemistry. For several years the pioneering development of these chemicals was aggressively followed by U. S. I. It is only of late that they have been available in sufficient quantities and at a low enough price to fulfill the industry's demands. Today, U. S. I. is the foremost producer of these important materials.

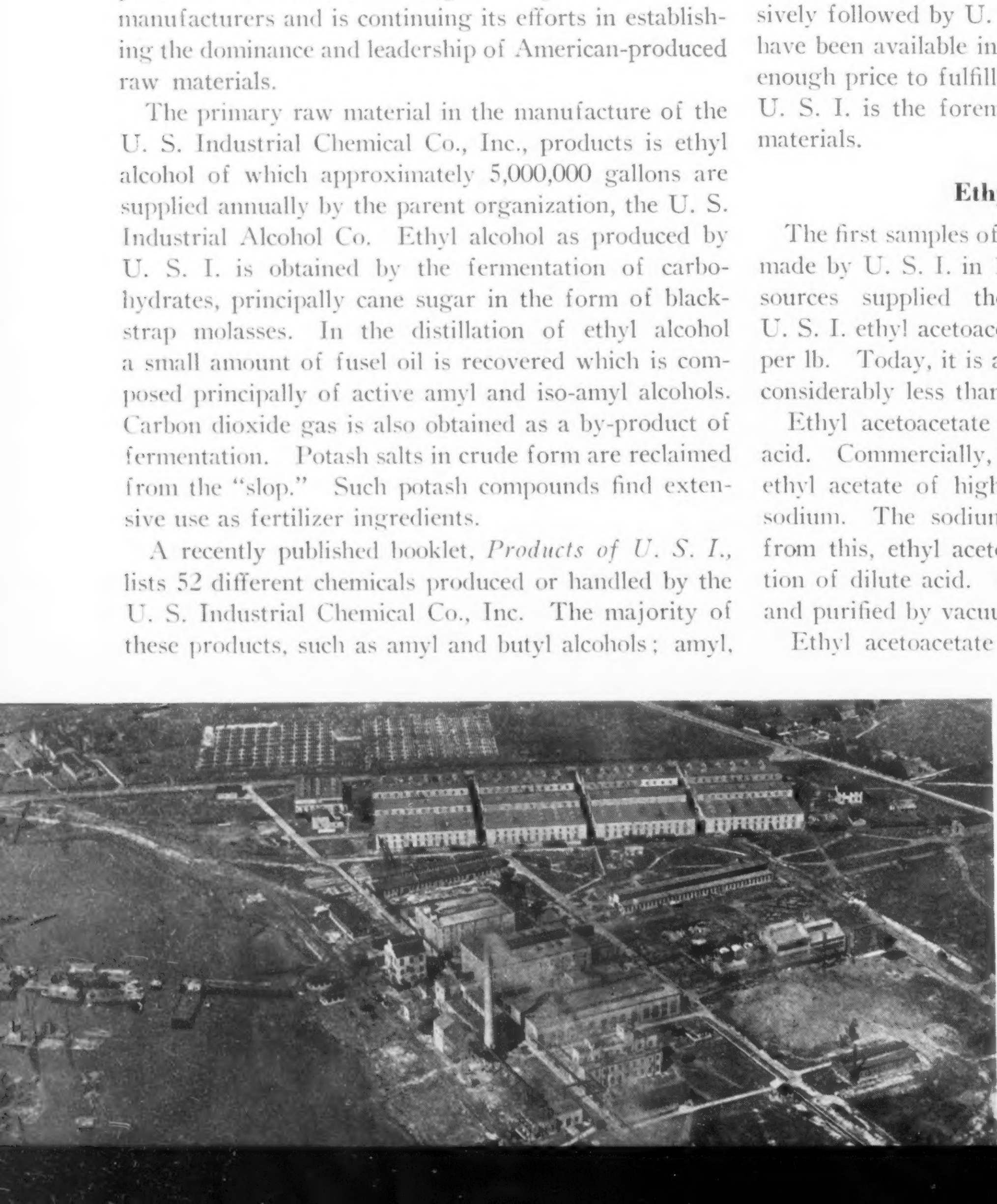
Ethyl Acetoacetate

The first samples of this chemical in this country were made by U. S. I. in 1922. Until recent years foreign sources supplied the industry's needs. Originally, U. S. I. ethyl acetoacetate sold at more than one dollar per lb. Today, it is available in unlimited quantities at considerably less than half that price.

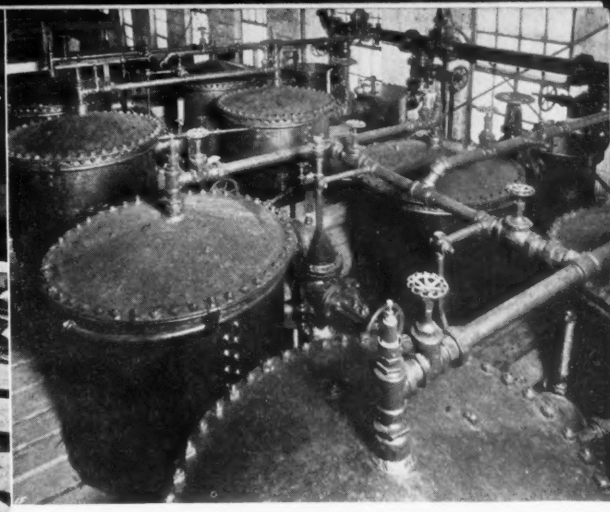
Ethyl acetoacetate is the ethyl ester of acetoacetic acid. Commercially, this ester is prepared by allowing ethyl acetate of highest purity to react with metallic sodium. The sodium derivative is first formed and from this, ethyl acetoacetate is liberated by the addition of dilute acid. The crude ester is then separated and purified by vacuum distillation.

Ethyl acetoacetate is in substantial commercial use as an intermediate in the manufacture of pyrozolon dyes, such as hansa yellow and in pharmaceuticals such as antipyrine.

Long known in the dyestuff and pharmaceutical industries as a versatile raw material, the organic structure of ethyl acetoacetate permits a variety



Baltimore plant of the U. S. Industrial Chemical Co., Inc.



Left, drum filling and shipping department. Above, battery of gas purifying columns. Below, distillation columns for esters.

of chemical reactions leading to an extended list of valuable products.

Many new developments were held in abeyance by the high price of this ester in former years. However, it is firmly anticipated that low cost and ready availability will allow a number of its derivatives to take an increasingly important position in commercial fields.

Acetoacetanilid

Acetoacetanilid is derived from ethyl acetoacetate and aniline. U. S. I. has done much fundamental research on this process and has developed a technique which yields an excellent product at an attractive cost.

The reduction in price of ethyl acetoacetate has made it possible to reduce the cost and consequently the price of acetoacetanilid. The latter has been made available to dyestuff manufacturers for use in hansa yellow which is growing in importance as a dry color for the replacement of lead chromate pigments.

The pigment value of hansa yellow is about eight times that of lead chromate, and it is believed that a lower price for hansa yellow will materially assist in the gradual replacement of lead chromate both in printing inks and in paints.

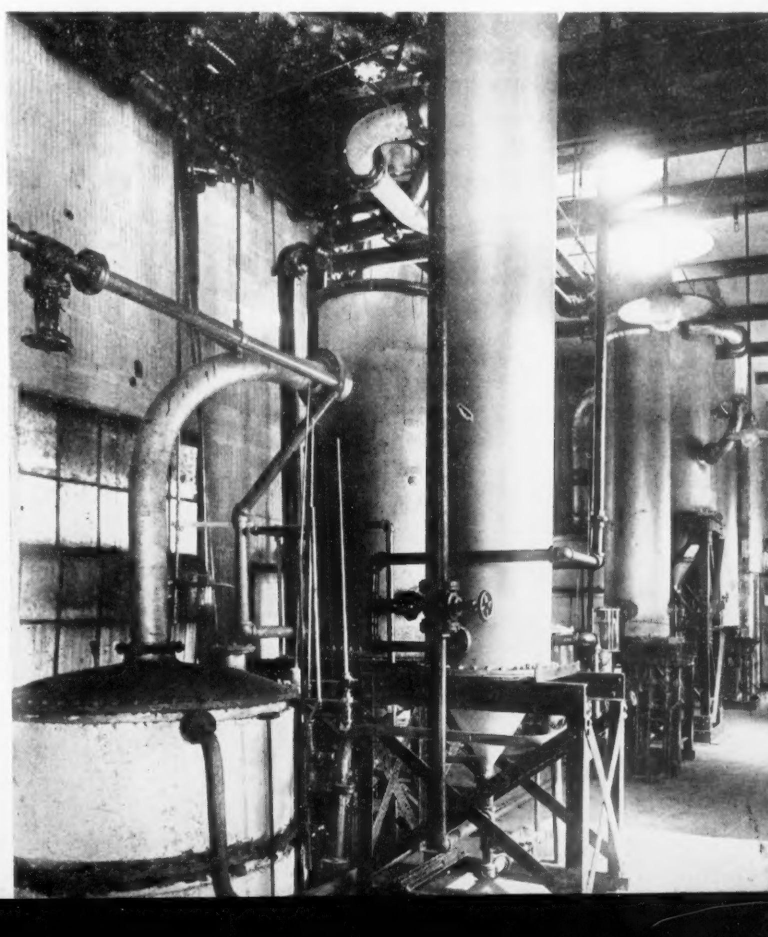
While large scale development of hansa yellow is hampered at the present time by the high price of meta nitro para toluidine, the other intermediate used in its manufacture, lower prices for acetoacetanilid will have a beneficial effect on the cost of the hansa yellow and, it is believed, will stimulate its wider use.

Due to the efforts of U. S. I. it has been possible to create a substantial domestic market for acetoacetanilid. This product could formerly be obtained only from foreign sources at a price of one dollar and fifty cents per pound in comparison with the present domestic market price of less than half this figure.

Sodium Ethyl Oxalacetate

A U. S. I. development of the last three years, sodium ethyl oxalacetate belongs with ethyl acetoacetate in the group generically known as beta keto compounds. Its principal use is in the production of tartrazine and pyrazolon dyestuffs for textile and other products. Its structure indicates the possibility of many organic couplings leading undoubtedly to whole new lines of products, and it is confidently expected that a further substantial use will be developed when its characteristics and working properties are fully investigated.

Sodium ethyl oxalacetate is the sodium salt of oxalacetic ethyl ester. It is made by reacting pure ethyl acetate and ethyl oxalate with metallic sodium, isolating and drying the resulting compound. While the pure ester, i.e., oxalacetic ester, is relatively unstable, the sodium salt as manufactured and sold by U. S. Industrial Chemical Co., Inc., is remarkably stable and entirely suitable for uses where the ester might be employed.



This important chemical, formerly of foreign origin, is now manufactured on a tonnage scale at a moderate price by U. S. I.

Ethyl Chlorcarbonate

While of earlier development than the three preceding chemicals, ethyl chlorcarbonate is another of the newer chemicals manufactured exclusively by U. S. I. In recent years, the U. S. Industrial Chemical Co., Inc., has produced this material in commercial quantities in company engineered equipment of unique design and under careful chemical control. During the period of development costs have been reduced more than fifty per cent.

The most important use for ethyl chlorcarbonate is in the production of flotation agents for the extraction of copper and other metals from their ores. It also finds use as an intermediate in the production of diethyl carbonate by reaction with anhydrous ethyl alcohol.

Ethyl chlorcarbonate is the chlorcarbonic acid ester of ethyl alcohol, and is also known as ethyl chlorformate. It is prepared by reacting carbon monoxide with gaseous chlorine, producing phosgene ($COCl_2$), which is then reacted with anhydrous ethyl alcohol giving ethyl chlorcarbonate and splitting off hydrochloric acid.

Owing to the poisonous and corrosive character of the finished product as well as that of some of the raw materials, all reactions take place in special resistant equipment. The product is shipped in glass carboys or lead lined containers.

Cellulose Acetate

For the purpose of providing an additional outlet for alcohol in the form of acetic acid, U. S. I. has developed and patented a new process for the manufacture of cellulose acetate, which forms the basic material for acetate type artificial silks, photographic films, coated fabrics, shatter-proof glass, etc.

Ethylene

While ethylene has been manufactured by U. S. I. for more than a decade, continuous development has resulted in a product of highest purity. Specially purified ethylene is a safe and efficient anesthetic and has been widely accepted by the medical profession.

Ethylene is a hydrocarbon gas and the first member of the olefine series. When ethyl alcohol is subjected to a suitable catalytic dehydrating agent at an elevated temperature, one molecule of water splits off, and ethylene is produced. This resulting gas is scrubbed, carefully purified and then compressed into cylinders.

The broadest use for ethylene is as a ripening and conditioning agent for fruits and vegetables. Government research and farm laboratories have adequately demonstrated that this gas in minute concentration speeds the ripening metabolism in fruits and vegetables. Farm products so processed reach the consuming market earlier and in improved appearance.

Ethylene is also employed as a hydrocarbon fuel gas for cutting, welding, brazing, as well as a raw material in the synthesis of many organic chemicals.

The U. S. Industrial Chemical Co.

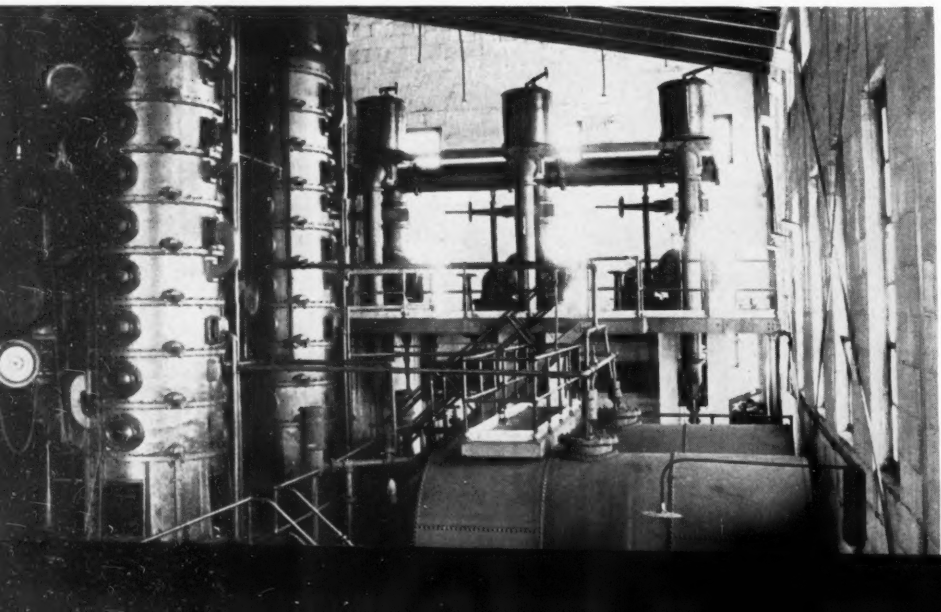
Incorporated in 1917, the U. S. Industrial Chemical Company, Inc., has its plant at Curtis Bay, Baltimore, Maryland, within a short distance of the main plant of the U. S. Industrial Alcohol Co. The executive offices are located in the Lincoln Building, New York City. Research is conducted in a new modern laboratory at Stamford, Connecticut, within easy access of the main office.

U. S. Industrial Chemical Co., Inc., not only manufactures pure chemical compounds but in addition thereto it has developed a great variety of compounded solvents for the manifold uses of industry.

The widespread and fully equipped facilities of U. S. I. insure all users of prompt, dependable service on any of the products referred to herein. Further information concerning these products and their uses may be obtained from any of the U. S. I. offices located in the leading cities of the country.

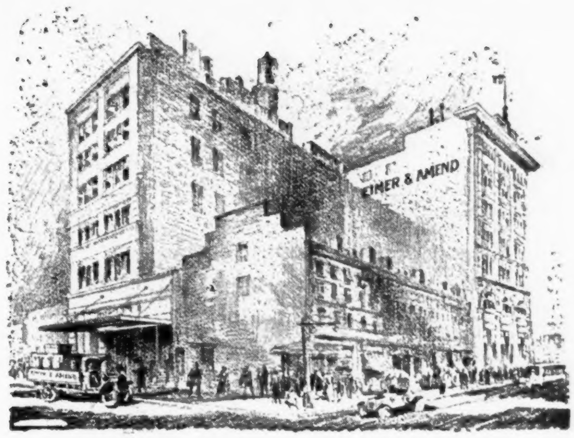
New developments in the solvent industry are brought to the attention of executives and technicians by means of *Solvent News*, appearing regularly each month as a colored insert in the leading chemical trade magazines. *Solvent News* is written and published by the technical staff of the U. S. Industrial Chemical Company, Inc. This monthly bulletin will be mailed to chemists and executives upon request.

The new booklet *Products of U. S. I.* gives detailed information on the origin, specifications and applications of the 52 chemicals listed. Technicians find this booklet valuable for reference since it includes methods of testing, and technical and commercial information relative to solvents, plasticizers and chemicals of alcohol origin.



Field scrubbers for gas washing.

Reagents and Apparatus



Eighty-four Years of Supplying Tools to the Laboratories of America

THE firm which grew into Eimer & Amend, was established in 1851 by Bernard G. Amend, who was born in Darmstadt, Hessia, in 1821. Mr. Amend was a trained pharmacist and chemist and knew Moldenhauer and Liebig intimately. For several years he assisted Liebig in his laboratory at Giessen. There he met Professor Horsford of the department of chemistry at Harvard College. In 1847 he came to New York with the idea of joining Professor Horsford at Cambridge. However, on arriving in New York, in order to earn money, he obtained a position with Dr. Milnor who had a drug store at the northeast corner of 18th Street and 3rd Avenue. In 1851 Dr. Milnor retired, and Mr. Amend took over his drug business. Prominent men, such as Hamilton Fish, Samuel J. Tilden, Peter Cooper, Abram S. Hewitt, Cyrus W. Field, Washington Irving, and Charles A. Dana were his friends.

Mr. Amend insisted on the highest ideals in connection with the dispensing and preparation of drugs and medicines.

In 1856, an old schoolmate, Carl Eimer, became a junior partner, and the name Eimer and Amend was adopted. Soon after, the company began to import fine chemicals and laboratory apparatus. In 1874 Mr. Amend decided to carry in stock a full line of assay, chemical, physical, and medical laboratory equipment. August Eimer, nephew of Carl Eimer, was put in charge of this department.

On August 1, 1874, Mr. Amend and a group of distinguished chemists gathered at Priestley's grave at Northumberland, Pennsylvania, and the formation of a chemical society was discussed. Mr. Amend was a charter member of the American Chemical Society, which was formed in 1876 and which now has a membership of 17,000.

That same year Eimer and Amend acquired two new buildings. In 1886 a seven-story building was erected at the corner of 18th Street and 3rd Avenue. Other additions followed in 1896 and 1899. A ten-story addition was built in 1907. Later another ten-story structure was erected on 19th Street. Today, with four acres of floor space, Eimer and Amend occupies the full block on 3rd Avenue between 18th and 19th Streets, extending about one-third of the distance to Second Avenue.

Carl Eimer retired in 1883 leaving Mr. Amend sole owner. The business was incorporated in 1897. Mr. Amend included as directors his three sons: Otto P., Robert F., and C. A. Lincoln, also his nephew, Edward B. Amend, and August Eimer. Mr. Amend remained President until his death in April, 1911. He was succeeded by August Eimer, who had married Mr. Amend's only daughter.

At the outbreak of the World War, Eimer and Amend happened to have an unusually large stock. This stock and all other facilities of the company were placed at the disposal of the government with no advance in list prices.

Mr. Eimer remained president until 1925. He was succeeded by O. P. Amend, Bernard Amend's son, who retired in October, 1934, on account of illness. Dr. C. G. Amend, grandson of Bernard G. Amend, who received his doctorate in chemistry from Columbia University in 1910, is now president and active head of the company.

Eimer and Amend specialize in chemical and biological laboratory apparatus, also in chemical reagents, drugs, stains, and standard solutions.

Connected with the American Chemical Society from its very inception, Eimer and Amend has grown with the growth of the society and we are looking forward to still larger growth and still closer cooperation with the society. Members and their friends are most cordially invited to visit the establishment at 3rd Avenue, 18th to 19th Street, New York.

Fluorine Compounds

The Sterling Products Company, Experts on the Most Active Element

Howard B. Bishop, President.

WHEN John P. Wildsmith signed his name to a document on the 10th of April, 1876, transferring to one Sydney Newsham "for and in consideration of sixty dollars lawful money of the United States, the following apparatus, to-wit:

Three Kettles	Tub
Two Covers	Two Receivers
Condenser	Four sets grates and bars
Three Cast Iron Plates	Clamps
Two Carboys Vitriol	Bbl. Fluorspar
100 lbs. Fluoric Acid	Lead Pipes

& all the apparatus used by me in the manufacture of Fluoric Acid."

he unwittingly laid the foundation for the Sterling Products Company manufacture of hydrofluoric acid. The apparatus and right to manufacture hydrofluoric acid by this method were purchased and developed by the John C. Wiarda Co., of Brooklyn, New York. Howard B. Bishop, who in 1912 invented the rotary-still continuous method of hydrofluoric acid manufacture, took over the John C. Wiarda Co. in 1921.

Mr. Bishop, together with a partner, had bought out the Chloroxine Company, a small bleach manufacturing plant in Brooklyn and had added to its bleach business the manufacture of a hydrofluoric acid compound under the name of Erusticator, for the removal of rust stains from fabrics in the home and in commercial laundries.

With Mr. Bishop's intimate knowledge of fluorine and its compounds, he and his partner were able to develop certain fluorides and fluorine salts for the souring operation in the laundry industry under the name of Erusto Salts. This discovery revolutionized the laundry industry by giving it for the first time a harmless and efficient sour. Today, Erusto Salts is a principal sour used in laundries, and oxalic and sulphuric acid salts have almost disappeared from that industry.

Mr. Bishop continued the manufacture of hydrofluoric acid, both commercial and c.p., and many forms of fluorine compounds in the Wiarda plant for a number of years. In the meantime, the old Chloroxine Co., had been renamed the Sterling Products Company; and in 1917, its plant was moved to Easton, Pennsylvania. In 1930, Mr. Bishop discontinued the Wiarda plant and transferred the manufacturng operations to the Sterling Products Company plant in Easton. In April, 1932, he assumed full control of the combined business and has expanded the business and improved the manufacturing methods.

In the laundry field, the company now manufactures Erusticator, the original rust stain remover, and Erusto Salts, the safe laundry sour, and a number of other products including Erusto Blue, in crystal and liquid form; Erustohue, a combination of Erusto Salts and Erusto Blue for souring and bluing in one operation; Erustolax, a presoftening compound for use in the break bath to facilitate the washing of clothes and shorten the washing time; Erusto Stripper, a preparation for stripping dyes and removing various classes of stains; Erusto Solvent for removing grease, oil and tar stains; and Erusto-Cetic, a new sour for use in wet cleaning in dry cleaning plants where acetic acid has been generally used.

Several years ago, the Sterling Products Company developed a process of manufacturing anhydrous hydrofluoric acid, which had never been made before in commercial form. It also manufactures commercial hydrofluoric acid in concentrations of 60 per cent., 48 per cent., and 30 per cent., producing a special iron-free product, especially adapted for certain purposes where iron is objectionable.

With its long history in the manufacture of fluorine compounds and its special equipment for that purpose operated by men trained for years in that particular line, the Sterling Products Company is probably better equipped than any concern in the country to supply any special fluorine salts required by American industries.

The Sterling Plant at Easton, Pa.

A History of Service

IN the last quarter of the nineteenth century, the Schoellkopf family built at Buffalo, New York, the dye factory which formed the starting point of the National Aniline & Chemical Co., the initial step in the practical commercial manufacture of dyes in America. This industry, established in 1879, has been continuously operated since that time in its present location at Buffalo, New York. Through this inheritance the American dyestuff industry was created.

The Call to Arms

Following the outbreak of the World War when the supply of imported dyes and other synthetic organic chemicals was almost entirely shut off, there developed an acute dye famine which threatened the activity of the textile and the kindred industries.

Faced with the tragedy of an absence of color—white dresses, winter and summer, white clothes and shoes, white gloves and hats, white rugs and furniture and draperies—a hundred million people of the United States, face to face with the everlasting monotony of white, nothing but white—this one company, schooled through years of experience, possessing a plant capacity exceeding all others, stood between America and the tragedy of white and in so doing, "earned the grateful recognition of a multitude of American consumers of dyes by swiftly enlarging the capacity of its works so as to alleviate materially the severity of the dyestuff famine to which our textile and allied interests had been exposed."[1]

Following expansion of the Schoellkopf plant, National Aniline & Chemical Company, Inc., when formed in 1917, combined the properties and business of the W. Beckers Aniline & Chemical Works, Inc., of Brooklyn, New York, the Benzol Products Company of Marcus Hook, Pennsylvania, and Standard Aniline Products, Inc., of Wappingers Falls and Newburg, New York, as well as the business of the Century Colors Corporation of New York. Consolidation of all plants at Buffalo, on the original site of the old Schoellkopf plant, was effected from 1921 to 1924.

National Carries On

It is this record of achievements by its pioneering forefathers and the realization of its responsibilities, not only as a source of essential products in time of peace but the greater responsibility of its vital necessity in the nation's defense in time of war, that has been the driving force back of National's continued progress.

The consolidation of operations at Buffalo resulted in improved efficiency and economy in the production and quality of its products. Branch office and warehouse facilities have been extended so as to assure maximum service. The services of splendid laboratories with every modern facility under the direction of thoroughly trained chemists are instantly available. Trained technicians with a wealth of practical experience in the various fields of color application are continuously

EXECUTIVE OFFICES

NATIONAL ANILINE & CHEMICAL COMPANY, INC.
40 Rector St., New York, N. Y.

BRANCH OFFICES

Boston	Charlotte
Providence	Greensboro
Chicago	Atlanta
Philadelphia	Chattanooga
San Francisco	Portland, Ore.

Toronto

Branches and Distributors throughout the World

[1] "Artificial Dyestuffs used in the United States," by Thomas H. Norton, Department of Commerce, Special Agents, Series—No. 121.

engaged in solving the many problems with which these industries are constantly confronted. Against this background is found a sales organization thoroughly trained through years of experience to the individual needs of each customer.

This unequalled service, coupled with the certainty of a complete line of standardized products, instantly available at conveniently located warehouses, is responsible for the ever-increasing demand for National products.

The influencing as well as the essential need for National's products in industrial life is emphasized by the following brief list of those trades currently served by the company.

Cotton, wool, silk, rayon, carpet, rug, linen, jute, hosiery, hat, garment dyeing, paper, leather, paint and varnish, fur, straw, drapery, furniture, wood-stain, ink, upholstery, feather, artificial-flower, wall-covering, rubber, extract, bottling, baking, candy, ice cream, pharmaceutical, and plastic industries.

Improved dyeing technique, the ever-increasing demand for faster colors as well as the development of new and unusual uses for existing types, invites a review of the current progress recorded by National in meeting these present-day demands.

Carbanthrene Vat Printing Powders

The successful development of this complete line of instantly dispersable vat colors, extensively used by printers of cotton, rayon, and silk, is the outstanding recent achievement of the domestic dyestuff industry. Their unusual penetrative and level dyeing qualities with the assurance of consistent results on repeat orders has proven invaluable to the textile industry.

Printsols and Naphthoic Colors

In step with the current demand for all-round fastness and bright bloomy shades on cotton, National has developed a comprehensive line of Naphthoic colors—naphthols, salts and bases—as well as the related Printsol printing types with their outstanding advantage of simplified application.

Para Dyes

National Para dyes, another recent development, comprise a distinctive line of leather colors possessing the outstanding qualities of level dyeing at a lower pH and at the same time producing the low grain effects so desirable. The penetrative qualities of National Para dyes and the excellence of their reaction to glazing, commend them to the attention of the discriminating dyer.

Resin Colors

In this new field of color application National has developed an unusual range of dyes for both cast and moulded resins. The importance of this development can be gauged when consideration is given to the fact that vast quantities of these phenolic resins are firmly established as basic materials throughout the electrical, automobile, and varnish industries, and from day to day are rapidly entering new and varied fields of endeavor.

It is the synthetic organic compounds developed in connection with the establishment of a self-contained dye industry that have made possible the plastic industry and largely assume responsibility for the rapid development of the rubber and lacquer industries.

Rubber Industry

The far-reaching effect of these chemical developments is reflected in the progress recorded by the rubber industry since the advent of organic accelerators and anti-oxidants. It is these two products that have completely revolutionized that industry by speeding up the rate at which rubber is vulcanized as well as increasing its wearing qualities and resistance to aging.

Again we find National responding to this demand, supplying in turn—aniline oil for the manufacture of rubber accelerators, beta naphthol, alpha naphthylamine, and beta naphthylamine for the production of the anti-oxidants.

Paint and Varnish Industry

In recent years, the unprecedented development of the paint and varnish industry along the new lines of nitrocellulose lacquers and quick-drying varnishes and enamels found National prepared to supply those raw materials—phthalic anhydride, maleic acid and anhydride and succinic acid and anhydride—required for the manufacture of plasticizers and synthetic resins to meet the urgent and ever increasing demands of these new coating compositions.

Certified Food Colors

As the outstanding domestic producer of the permitted certified food colors so widely used in beverages, confectionery, and food products, National exercises unusual precautions in their manufacture, certifying through the U. S. Department of Agriculture, the purity of each lot produced.

Pharmaceuticals

Of more serious importance to the welfare of man is the development and perfection by National's Pharmaceutical Laboratories of a complete line of certified biological stains and laboratory reagents. It was through the initial efforts of this one company that America today is independent of foreign sources for these products—so essential to the health and happiness of this nation.

It is this organization, schooled in its inheritance of experience, supported by every modern laboratory and industrial facility, staffed by the keenest of chemical minds, that is freely offered American industry in solving their problems in the field of organic chemistry.

—(Adv.)

"The Finger of the Chemical Clock Points Upward"

The Company that Developed Kryolith

PHILADELPHIA, in the middle of the last century, was recognized as chemical manufacturing headquarters of the country. Among its outstanding citizens were a number of substantial business men of chemical foresight and financial courage. In 1850, a group of them, including George T. Lewis, Charles Lennig, Samuel F. Fisher, T. G. Hollingsworth, George C. Carson, Charles Newbold, and Thomas Sparks incorporated the Pennsylvania Salt Manufacturing Company.

A patent of Dr. Richard Tilghman's for the manufacture of "the alkaline salts of soda" was the idea behind the organization of the company. When this process proved to be impractical in commercial operation, it was only the perseverance and chemical experience of the founders that kept the business alive and worked out other processes for the manufacture of other chemicals. The plants at Natrona, Pennsylvania, was built and these new projects fairly launched. Since 1908 its public utility plants have supplied the Natrona district continuously.

A Home Art Becomes an Industry

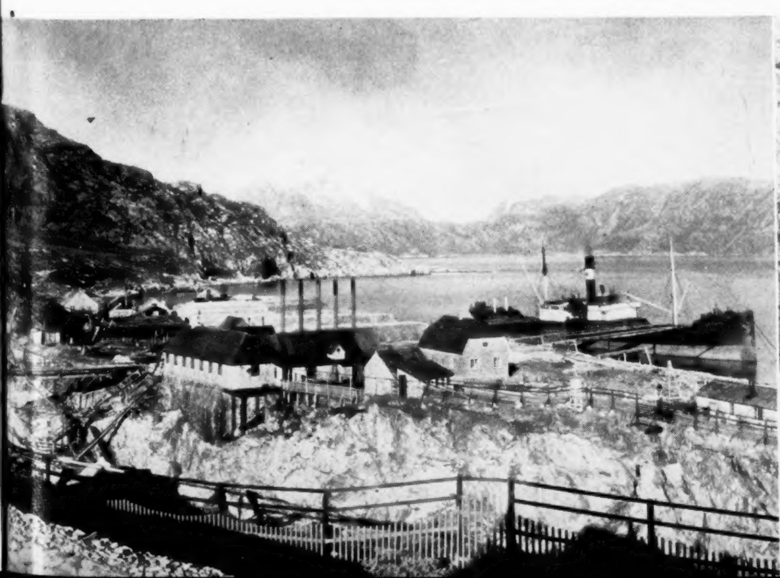
In early days, as at the present time, soap making was largely a home handicraft. Prior to the perfection of lye, homemade soap, based on the saponification of fats and greases collected in the kitchen and in the slaughtering of hogs, was produced by the alkali action of the potash in wood ashes, which was a messy and bothersome operation. The introduction of lye in place of the dirty pot-ashes was a real advance in this ancient art, a cleaner, quicker, more economical operation, and a veritable boon to housewives.

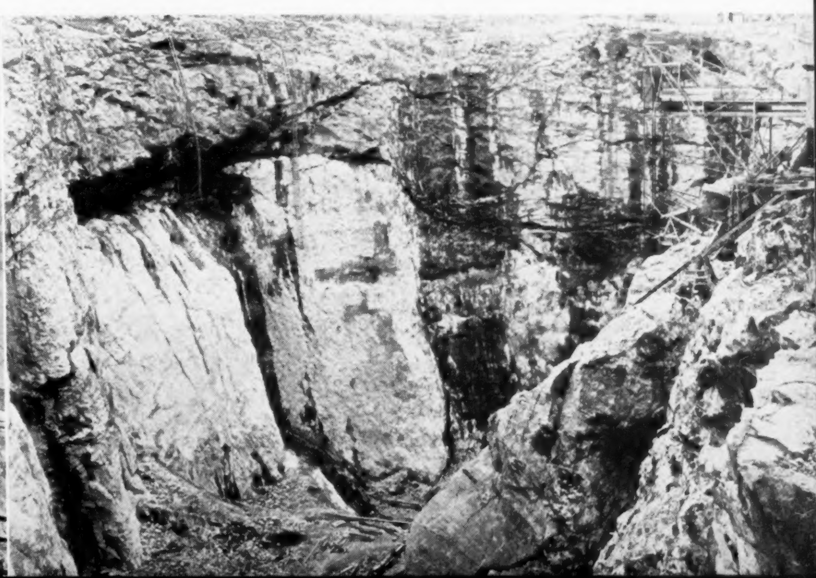
The Patented Lye

The lye was made first from imported caustic and later by causticizing imported soda ash. During 1855, before the patent for "Saponifier" was granted to George Thompson, the company's secretary-treasurer, experiments were begun towards the production of soda ash from salt. Upon the foundations of this research and this patent were eventually built success. To this day, the company has held a strong position in the alkali field and lye industry.

During the early sixties, the Pennsylvania Salt Manufacturing Company might quite easily have entered the petroleum industry. Oil was found adjacent to the plant at Natrona, and a small hundred-barrel-per-day refinery built. In 1860, 500 barrels of Natrona oil at 50¢ a gallon were shipped to London, the first American refined petroleum products that ever left the United States. At this time, Henry H. Rogers was

Left, Greenland's icy mountains look down on the mining and loading kryolith operations. Right, interior of a kryolith mine.





chemist and assistant superintendent in the Natrona plant, and he had already made some of the petroleum refining experiments, which later made him so prominent in the oil refining industry. But the directors were chemically-minded and persistent in concentrating upon the chemical development of the Salt Company.

The plant at Wyandotte, Mich.

Shortly after the close of the Civil War, the Pennsylvania Salt Company secured an exclusive American import contract for kryolith from the unique deposits in Greenland, and so entered into a second great development period. From 1865 to the present day that agreement has been continuously in force, and this interesting double salt (sodium and aluminum fluoride) has been the starting point of a most valuable chain of chemical products. Formerly it was broken up by calcining, to yield caustic soda, sodium aluminate, and calcium fluoride, the end-products after treatment with carbon dioxide being sodium bicarbonate and alumina, the latter being converted to alum by means of sulfuric acid; but in recent years this practice has been discontinued, kryolith having found important uses in the arts, especially in producing metals, ceramics, glass, insecticides, enamels, etc.

Thus, the Pennsylvania Salt Manufacturing Company became the pioneer American producer of caustic soda and of sodium bicarbonate. While working up alumina into alum, they developed a patented process for the manufacture of porous alum especially suitable for papermaker's use. It is one of their proudest accomplishments that they have on their books today as contract customers paper mills which adopted the use of "Natrona Porous Alum" in 1868, the first year of its introduction.

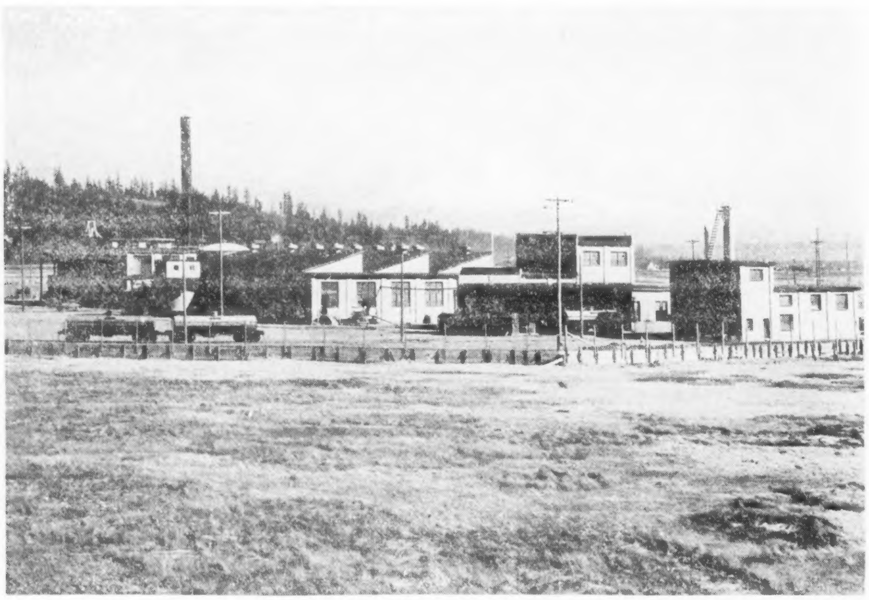
In 1870 the Greenwich works were opened on the Delaware riverfront in Philadelphia, eighty acres of land having been purchased. Camphor was refined here for several years, but the chief operation was the production of sulfuric acid, at first from brimstone, but later from imported pyrites. This last operation led to extensive experiments in the refining of copper from low-grade ores, which was an important part of the business up to the end of the century.

Entering the Electrolytic Field

In 1898 the company, having determined to go into large scale electrolytic production of caustic and chlorine, purchased on the Detroit River a tract of over 130 acres, overlying enormous salt beds, and here built their Wyandotte plant. It was from this plant that in November, 1909, the first tank car of liquid chlorine was shipped in America. Here, besides package lye, a full line of chlorine products has been developed—hydrochloric acid, bleaching powder (including the high test product), carbon tetrachloride, ferric chloride (liquid and the new anhydrous)—and ammonia.

Shortly after the World War, the plant of the Michi-

The company's newest operation at Tacoma, Washington.



Since shortly after the Civil War, the Pennsylvania Salt Manufacturing Company has made chemicals from the mineral under these snows.

gan Electrochemical Company, at Menominee, Michigan, was taken over. This operation has been discontinued since the company's latest expansion, the big, new electrolytic alkali plant at Tacoma, Washington, which was opened in 1928. This western development is in line with the company's well-thought-out program of expansion based on the scrupulous research for new markets and goods that come within the cycle of their operations.

The Pennsylvania Salt Manufacturing Company has added within recent years many specialties: Kryocide for insecticide purposes, Perchloron (high-test calcium hypochlorite), Old Hickory Smoked Salt, acid-proof cement, sodium hypochlorite, superphosphate, and BK.

Chemically Concentrated

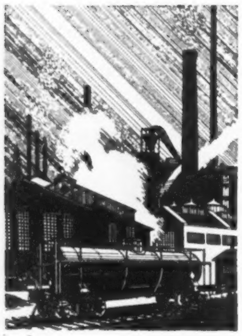
After this brief sketch of the history of the Pennsylvania Salt Manufacturing Company, a broader survey of its activities and policies brings to the fore a couple of thoughts which graphically sum up its successful experience. The company has continued in the hands of a distinctly chemically-minded management, which has always—to borrow a couple of mottoes from sporting slang—"kept its eye on the ball" and "paddled its own canoe." They have resolutely refused all offers to merge or consolidate with other interests; maintaining a large and efficient development and research department, the purpose of which is to improve its own products and develop new lines that properly fit in with its present fields of endeavor. Almost all of these ventures have turned out to be vastly profitable. The policy of concentrating upon the task in hand has established a record of continuous dividends since 1863 upon a chemicals business that has been built up item by item in a thoroughly logical chain of chemical expansion.

The company's products are several of them notable for their extreme chemical purity—sulfate of aluminum, chlorine, acid, etc. They market a grade of salt guaranteed free from lime and magnesia; and they make an exceptional grade of caustic soda particularly to meet the exacting requirements of the rayon industry.

There has been at least one other, highly important by-product of this policy of specialization. Back in 1898, *The Engineering and Mining Journal* (Vol. 49, p570) said:

"The aim of the managers of this company has been to conduct its business on a scale and at a cost which would ensure uniform excellence as well as cheapness. Whatever bears the stamp of the 'Keystone Quaker' is recognized by the trade as the best goods on the market, whether of home or of foreign manufacture, and the reputation of the Pennsylvania Salt Manufacturing Company for fair and liberal dealing and the most scrupulous honor is as well known as its trademark."

American Cyanamid Company
Its Origin and Growth



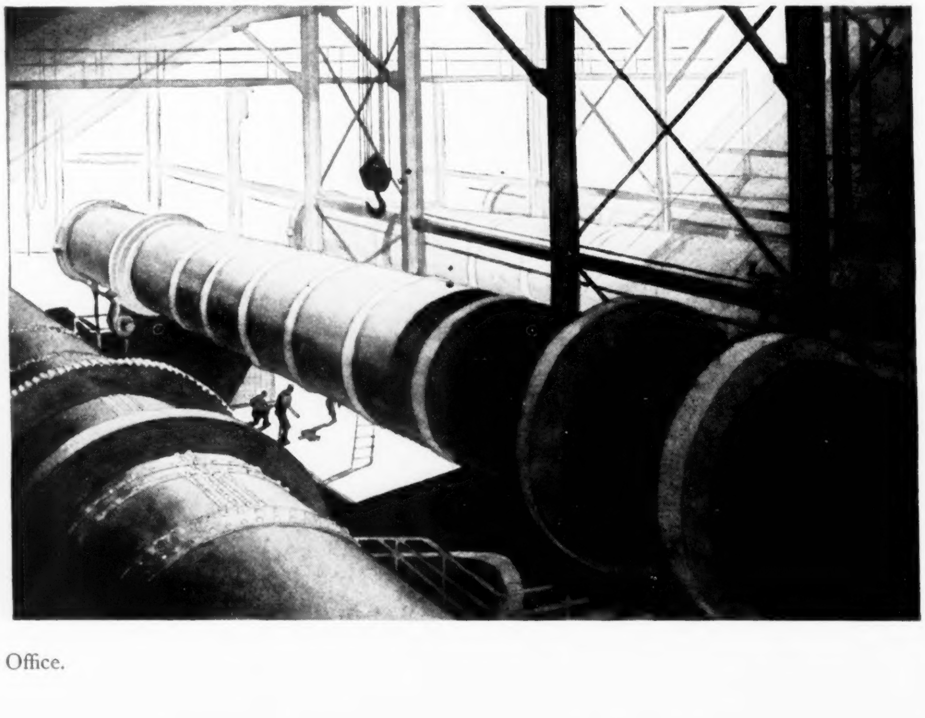
The American Cyanamid Company was founded nearly thirty years ago to develop in America the cyanamid process for the fixation of atmospheric nitrogen. The initial product of this process is calcium cyanamid, which finds its principal use in fertilizer. The company, therefore, had its earliest development as a supplier of nitrogenous material to the American fertilizer industry and later as the producer of "Ammo-Phos"* which was the first highly concentrated chemical fertilizer. Ammo-Phos quickly found an important market even in distant parts of the world, for which it was loaded into boats at the company's deep-water plant at Warners, New Jersey.

Through other chemical products from cyanamid and intermediates produced in the Ammo-Phos process, the company expanded into other fields. Later, through merger of a considerable number of related but non-competing units there was established a diversified chemical business of which the fertilizer branch—while fully maintaining its relative position in the American fertilizer industry—now represents only a minor percentage of the company's total production and sales.

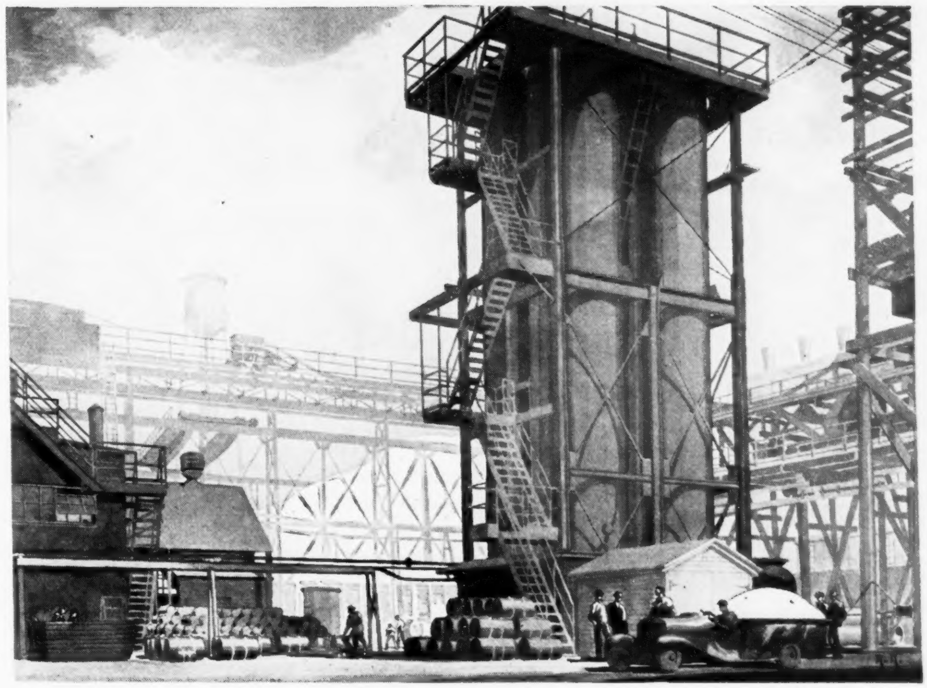
The company now owns and operates, directly or through subsidiary companies, twenty-eight American plants in nineteen states and employs six thousand five hundred American workers, manufacturing hundreds of different products. In order more fully to serve the American industries consuming these products, the company and its subsidiaries sell many additional products not of their own manufacture. Its service extends to practically every type of American manufacturing process in which chemicals are used. Its chemicals are supplied in substantial quantity to the agricultural, mining, textile, paper and pulp, paint, varnish and lacquer, leather, rubber, metal, oil-refining, soap, oilcloth and linoleum, glass and ceramic, dry color, printing-ink, adhesive, plastics and many other industries.

On other pages is described the contribution to American industry of The Calco Chemical Company, Inc., manufacturers of dyestuffs and intermediates, which is a division of American Cyanamid Company. This statement deals particularly with the operating departments of the parent company, with the American Cyanamid & Chemical Corporation, a subsidiary into which the heavy chemical and industrial chemical branches of the business have for the most part been consolidated, and with the Chemical Construction Corporation, a subsidiary engaged in the design and construction of complete chemical units.

Dealing first with the manufacturing divisions: their field of activity includes the production of mineral acids, heavy chemicals, fertilizer materials, commercial explosives, mining chemicals, flotation reagents, insecticides, organic acids, esters, plasticizers, solvents, synthetic resins and plastics, tanning agents, textile chemicals and paper chemicals, besides important intermediates for the chemical industry. Bauxite mines, phosphate mines and limestone quarries are operated to supply raw materials for the chemical operations. Gypsum for building construction is produced in substantial tonnages from



* Registered United States Patent Office.



by-products of chemical manufacture.

The present organization of these manufacturing divisions has resulted from many years of experience in serving the chemical requirements of American industry. It is in part the result of successful pioneering, and represents the present stage of development of chemical services which began at a time when the American chemical industry was a mere infant.

Into this organization, for example, has been merged The Kalbfleisch Corporation, which was founded more than one hundred years ago and which developed the production of heavy chemicals, paper sizes, fillers and coatings. Into it also has gone A. Klipstein & Company, first started nearly seventy years ago as an importing company, assembling and bringing to the United States the contributions of foreign chemical industries which at that time were more highly developed. Later the company engaged in American manufacture largely because of inability of many of these foreign products to meet American requirements. It was a pioneer in the field of tanning, having introduced the use of quebracho extract into the United States, and supplied synthetic tanning materials to that industry, as well as supplying sizing compounds, sulphonated oils, and penetrants to the textile industry.

Into the present organization has also been merged The Selden Company, founded in the present generation but also a pioneer. The vanadium catalyst developed by The Selden Company (now a division of the American Cyanamid & Chemical Corporation) is utilized in the majority of new American plants built in the last decade for the production of sulphuric acid. The Selden Division has made many other contributions in the field of catalytic chemistry. It now serves to the American market—at a low cost made possible by highly developed catalytic processes—organic acids which only a few years ago were too expensive to be considered for the uses which now consume the major part of their entire production.

The engineering division is Chemical Construction Corporation, originated in 1914 by a group of engineers some of whom, even at that time, had acquired a nation-wide reputation as designers of acid and fertilizer plants. Among its early activities were the introduction of acid-proof masonry construction for sulphuric and nitric acid towers and tanks, invention of the masonry direct-fired "Chemico"* sulphuric acid concentrator widely used in American war-time plants, and the erection of numerous superphosphate and fertilizer plants and sulphuric acid chamber plants. To meet the growing need of acid-recovery systems for oil refineries, it invented the two-stage submerged pipe type of sulphuric-acid concentrator, which, in its present form as the "Chemico"* Drum-type Concentrator, is recognized as the standard heavy-duty acid concentrator by leading chemical and oil companies. This company also developed a simplified type of ammonia oxidation unit which was widely installed at chamber acid plants to replace nitre potting. It has designed and built contact sulphuric acid plants with a total annual capacity of eight hundred thousand tons of sulphuric acid monohydrate. Its organization has recently been expanded by the inclusion of the engineering group which developed the widely accepted Nitrogen Engineering Corporation processes for the production of synthetic ammonia and synthetic methanol.

Both the manufacturing divisions and the engineering division maintain well-staffed research and experimental laboratories from which come a steady flow of new developments in the chemical industry. A staff of mining experts is available not alone for the development of new chemicals for the mining industry but for service in the fields of flotation, ore extraction, and the like. Application laboratories are maintained for service in connection with the effective utilization of the company's products.

* Registered United States Patent Office.

Automobiles Coated, Run and Kept From Freezing by Sugar. Preposterous but True!

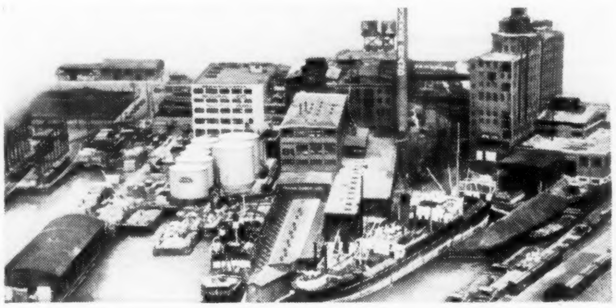
POUR the spoon of sugar over your morning cereal. Sweeten the cup of coffee. Breakfast finished, step into your automobile. Sugar is still with you! For alcohol, a by-product of sugar, finds its way into that beautiful coat of lacquer on your car. Start the motor, drive away. Sugar is still with you for in many cases you'll find that alcohol has been blended with gasoline to give added efficiency to the fuel in your tank. Now a winter's day. Temperature 10 below zero. Step into the car. Run it through sleet and snow. No matter how cold, the alcohol in your radiator will keep it from freezing. Sugar and its by-product, alcohol, are still with you! Sugar—and alcohol's contribution to the nation—goes further than the automobile. It reaches into almost every phase of industry throughout the world, on land and sea. Traveling bags, cosmetics, hats, dresses, silk stockings, shoes, perfumes, shaving creams, tonics, soap, ink, pencils, glass, ether, jewelry. The list would take much more space than this article allows.

Pennsylvania Sugar Company and its affiliated companies, Pennsylvania Alcohol Corporation and Franco-American Chemical Works, have contributed much to the alcohol and chemical industry for almost a quarter of a century. The plant of the Pennsylvania Sugar Company was built in Philadelphia in 1912. At that time sugar was the principal product. The construction of a new modern distillery was begun in 1923, completed in 1924, and the production of alcohol started in the fall of that year. Since then, the chemical activities of the company have expanded until today it is considered one of the leaders in a highly progressive and competitive field.

At the beginning of 1929, The Franco-American Chemical Works of Carlstadt, New Jersey, became affiliated with the Pennsylvania Sugar Company. By this union, the control of some of Franco's most important raw materials was assured by Pennsylvania Sugar Company's widespread interests in sugar, molasses, alcohol, and allied products.

Further expansion and increase in the business of the alcohol division of The Pennsylvania Sugar Co. resulted in the formation late in 1933 of The Pennsylvania Alcohol Corporation. Today, the resources, the modern plants, and above all, the alert and progressive attitude of the personnel of the Pennsylvania Sugar Company and its affiliated companies insure a continuation of the type of quality and service which the trade in every part of the country has the right to expect.

The sale of all alcohol and chemical products is handled through the sales office of A. K. Hamilton, 342 Madison Avenue, New York City. Sales representatives are located in the principal cities. Among the long list of products are the following: pure and denatured alcohol (all formulae), acetates (amyl, butyl, ethyl, propyl); butyl alcohol, normal; butyrates (amyl, butyl, ethyl, propyl); cotton base solutions; dibutyl phthalate; diethyl oxalate; ethyl chloride, commercial (for refrigeration and ethylation); formates (amyl, butyl, ethyl, propyl); gum solutions, isopropyl alcohol,



Plants of The Pennsylvania Sugar Company and Pennsylvania Alcohol Corporation at Philadelphia, Pa.

ketacetate, monomethyl ether ethylene glycol acetate, plasticizers, propionates (amyl, butyl, ethyl, propyl); refined fusel oil; secondary esters and alcohols, special esters, special solvents, tricresyl phosphate, Antidolorin (ethyl chloride of guaranteed purity for anaesthesia); artificial fruit esters (for flavoring); collodion U. S. P., flexible and plain; ethyl nitrite (for sweet spirits of nitre, U. S. P.); isoamyl alcohol, pure.

In addition to the above the Pennsylvania Alcohol Corporation markets denatured alcohol for anti-freeze purposes. In this field its products are the well-known Quaker Brand Denatured Alcohol and High Test Quaker Anti-Freeze.

The laboratory facilities and experience for over a quarter of a century are at the customer's disposal. The company policy, regardless of growth, will always take into consideration a full regard of the importance to the trade of standardized quality, flexibility of service, and intimate contact.

Carbide's Contribution to the Nation

If there is a good novel in every one's life, there are a half-dozen entire histories in the life of any successful company—the stories of the company's corporate existence, of its balance sheet, of the men who founded and built the business, of the products it makes and sells. But none of these is the best way to tell about the chemical contribution which the Union Carbide and Carbon Corporation and its subsidiaries have made to the nation.

Let us start with the very simple chemical reaction which generates acetylene from calcium carbide and water—$CaC_2 + 2H_2O = C_2H_2 + Ca(OH)_2$—and trace from it a vast and still growing chain of chemical products.

In the late eighties, a cotton-mill owner, Major J. T. Morehead, of Spray, North Carolina, having more water-power than he needed, became interested in the newly invented electric furnace. With Thomas A. Willson, an electrical engineer, he built one of these novelties; and the pioneering pair set to work smelting various ores with sundry fluxes, chiefly aiming to get aluminum from bauxite. One day in 1892 they loaded their little furnace with coke, ore, and lime. The product was a hard mass which showed no reduced metal. Water thrown upon it, however, brought forth a cloud of pungent gas that burst into flame. The tough mass was calcium carbide; the gas was acetylene.

Major Morehead saw that the brilliant illuminating and great heating powers of the new gas might make it a competitor of gas and kerosene. Patents were secured, and upon the expectation that acetylene would replace or enrich coal and water gas, a number of scattered carbide plants started to operate under patent licenses. Five started business between 1892 and 1897; only one was successful. The single successful exception was located at Sault Ste. Marie, Michigan. Backers of this enterprise were convinced by their unique success that the manufacture of carbide was practical. They bought the patent-rights, concentrated operations in a new plant at Niagara Falls and formed the Union Carbide Company in 1898.

Two series of development followed: the one perfecting and enlarging the electric furnace and its technique, the other opening up new uses for acetylene.

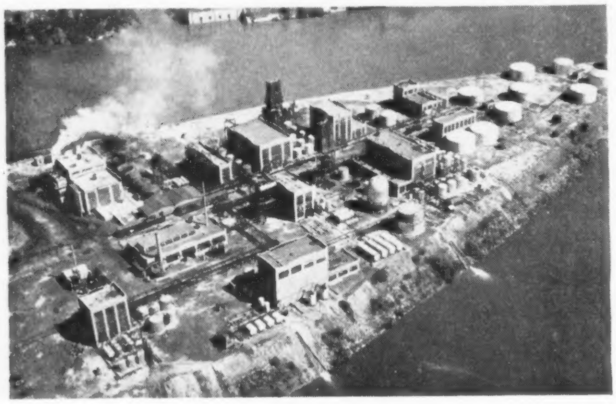
The development of the electric furnace was vital to the successful operation of a large-scale carbide process; and improved electric furnaces were largely a question of larger carbon electrodes. Herein lay the community of interest between the Union Carbide and National Carbon Companies—the latter having been formed in 1886 for the manufacture of carbon products. Out of their work on carbon electrodes for the carbide furnaces grew an allied but distinct industry, starting with the manufacture of carbon for arc lamps and progressing today to the manufacture of dry batteries, flashlights, brushes for electric generators and motors, radio B batteries, and a legion of products essential to a myriad of everyday uses. Only a short step beyond is graphite; and that step was taken in the consolidation of the Acheson Graphite Company, producing graphite electrodes for electrolytic and electro-smelting.

While this work was going forward at Niagara Falls

A practical monument to synthetic chemistry—Carbide's new plant at Whiting, Ind.

and later at the Soo, research was carried on in the production of various alloys. At the same time Major Morehead and Mr. Willson had continued working with various ores and fluxes. It was determined to pool experience and resources; and the Electro Metallurgical Company was formed to explore the possibilities of the carbide furnace in the production of metals and alloys.

A new and most valuable industry thus came into being, one without which many industries would be deprived of essential tools and equipment. Out of vast electric furnaces, consuming as much as 25,000 h.p., generating heat to 3000° C. and fed big batches of crude ores by overhead cranes, are tapped alloys whose metallic composition is checked in the test tube to fractions of one per cent. These alloys of iron with definite proportions of such metals as manganese, chrome, silicon, vanadium, etc., are used by the steel makers in producing those highly perfected alloy steels which give all industry the wide range of materials—rust-proof, corrosion-proof, abrasive-proof—for high-speed tools, for fine cutting edges, for springs, for ball bearings, for armour plate, for all sorts of specialized uses under the most particular and exacting conditions. These alloys, often made to order in ten-ton batches and meeting almost C. P. requirements, form a great group of metallic materials indispensable today to many industries. The chemical industry could not operate its modern high-pressure, high-temperature, corrosive processes without apparatus to meet these exceptionally difficult conditions.



Carbide's island at South Charleston, W. Va., showing portion of plant.

Formation of National Carbon

But to return to acetylene, the principal use of which, until 1907, had been for lighting and heating—in that year, a group of Cleveland business men, several of whom were associated with the National Carbon Company, began another development which was to have a great influence on the future of acetylene and the chemical industry. For the commercial utilization of Dr. Linde's liquid-air method of producing oxygen, they organized The Linde Air Products Company. The hot flame of acetylene burning in oxygen was now available for everyday cutting and welding of metals; the use of oxy-acetylene blowpipes, expanding tremendously during the intervening years, is now standard wherever metal is produced or fabricated.

An important step toward greater usefulness for acetylene was the discovery that the gas might be shipped, dissolved in acetone, in cylinders under pressure. This development was made by the Prest-O-Lite Company, Inc., which had been organized after the turn of the century to manufacture automobile lighting systems using small tanks of acetylene.

Beginning of Organic Research

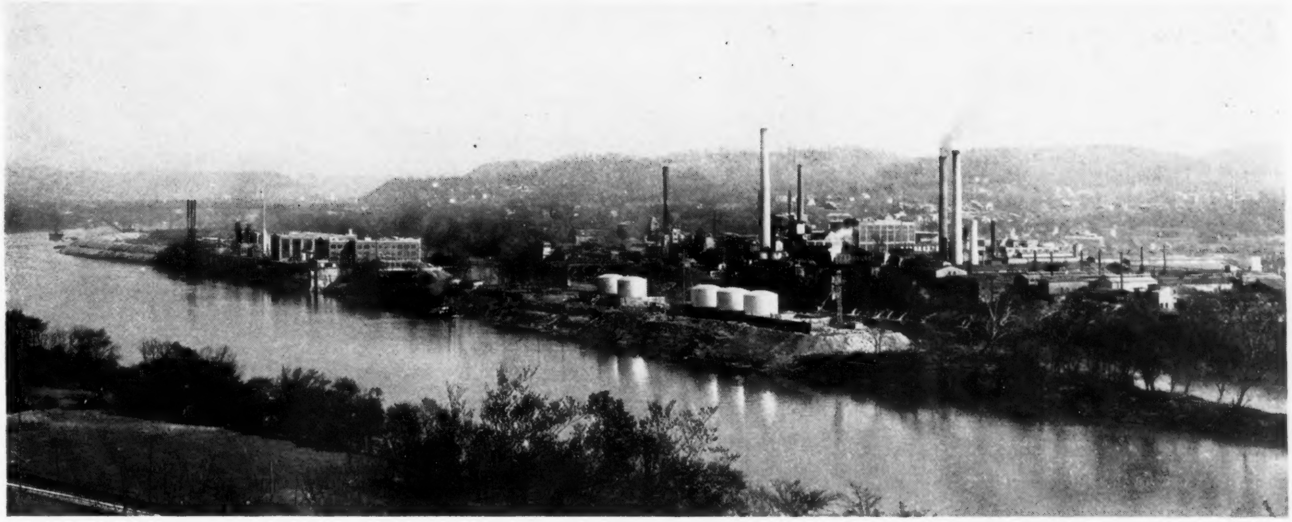
During the years from 1912 to 1920 much organic chemical research, and physical research on the separation of mixed gases, was carried on by the different companies which are now component parts of the Union Carbide and Carbon Corporation; and in 1920 the Carbide and Carbon Chemicals Corporation was formed to consolidate the results of this research, to extend it, and to capitalize it.

So began the commercial production of synthetic aliphatic chemicals. The Chemicals Corporation was not an acquired company but was conceived, established, and developed by men drafted from affiliated companies, men experienced in the particular industries involved and well-trained in the management methods of the parent corporation.

It was inevitable that theories and processes entirely sound in the laboratories should sometimes fail in the plant. Completed research was only the beginning. Theories had to be coupled with experience. Factories had to be built near the sources of raw material—small pilot plants at first, in which were carried out long series of empirical steps, while concurrently managers, chemists, engineers, and salesmen coordinated their efforts.

Development of Industrial Units

One by one, the many processes were completed—plants and equipment were enlarged into industrial units producing a large number of useful chemicals. Some of these chemicals were well known, with existing markets; others were wholly unknown as commercial products, and their usefulness was conjectural. In certain cases the new chemicals were of the "custom-built" variety. A particular industry would express the need for a compound with a certain set of physical and chemical properties. By varying the raw materials at hand or modifying the products already being produced, it was often possible to synthesize the desired chemical.



From the Charleston bank, a view of the Carbide & Carbon Chemicals Corporation's operation on the island and the plants on the mainland beyond.

Frequently it was found that a product developed for one industry would also solve the problem of another—thus, an excellent lacquer solvent turned out also to be an ideal constituent of a hydraulic brake fluid—a solvent which originally showed great promise as a wool-scouring agent also developed into an important extracting agent for oil refining.

Now Over Seventy Chemicals

The list of seven chemical compounds made in 1924 had doubled by 1929, and the additions have been even more rapid since that time. More than seventy chemicals were commercially available in 1934, half of them being sold and shipped to customers in tank-car quantities. These include eighteen alcohols of varying boiling points, and water solubility—fifteen esters of varying evaporation rates—and so on through the ethers, acids, amines, and other groups of synthetic organic chemicals.

A long-range research program has thus made available to industry during recent years this large number of synthetic aliphatic chemicals, most of them formerly laboratory curiosities. Many of them that had never appeared in the chemical literature are now used by widely diversified industries either to replace chemicals with less desirable characteristics or to utilize their distinctive properties.

Well-coordinated Research Program

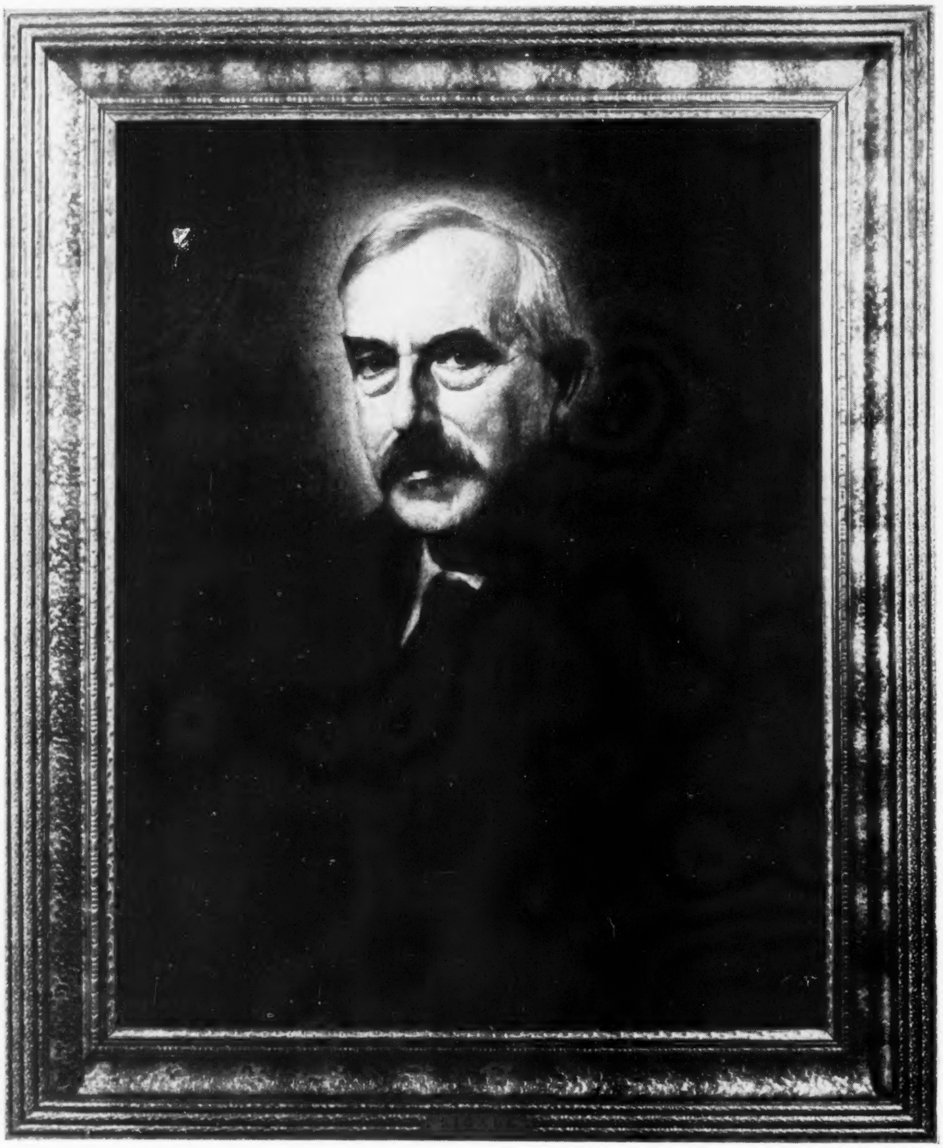
The development of the Carbide and Carbon Chemicals Corporation is an illustration of collective, well-coordinated commercial development within the affiliated groups of a modern corporation engaged in many fields of technical and scientific endeavor. It is recognized that the Chemicals Corporation could not have developed to its present industrial position had it not been able to utilize the many and varied resources of its affiliates and of the parent company. In addition to supplying personnel, the affiliated plants furnished many primary products and by-products which became basic raw materials for syntheses. Some of the processes developed in affiliated lines have also been utilized.

In developing chemical processes it is necessary to pioneer not alone in the products to be created, but also in the design and equipment and selection of materials. Here the associate companies' special steel alloys and oxy-acetylene technique have been most valuable.

The use of these interrelated processes, products, and resources has been made possible by the technical training of the personnel involved. All officials and principal department heads of the Chemicals Corporation are technical graduates; and its total personnel includes a nice balance of those holding various advanced technical degrees, a balance that extends equally among research and development, engineering and operations, sales and executive supervision.

Free from Vagaries of Nature

All of the company products, being made synthetically are practically free from the vagaries of nature and economic conditions: they are neither by-products dependent upon the activity of some other industry, nor are they natural products at the mercy of weather conditions. They are splendid examples of the best of chemistry's gifts to industry. From carbide, liquid air and ferro-alloys to new solvents and plasticizers, all are links in a logical chain of chemical technical developments. All are products of the research laboratory, brought to the market by salesmanship based on scientific knowledge of consumers' requirements. They are daily making possible better and more efficient products in many industrial fields. This story of a simple chemical reaction that has grown into a miniature organic chemical text book would not be complete without a list of the chemicals themselves. Such a list appears in the buying Index.



Chemical on Pacific

John Stauffer

A PIONEER development of any kind usually means a slow struggle against raw natural conditions, against hardship and unforeseen obstacles. In this sense the early history of the Stauffer Chemical Company was crowded with true pioneering. The slogan of the company today, "Pioneer Manufacturers of Heavy Chemicals on the Pacific Coast," is based on a background rich in contribution to the industrial development of California.

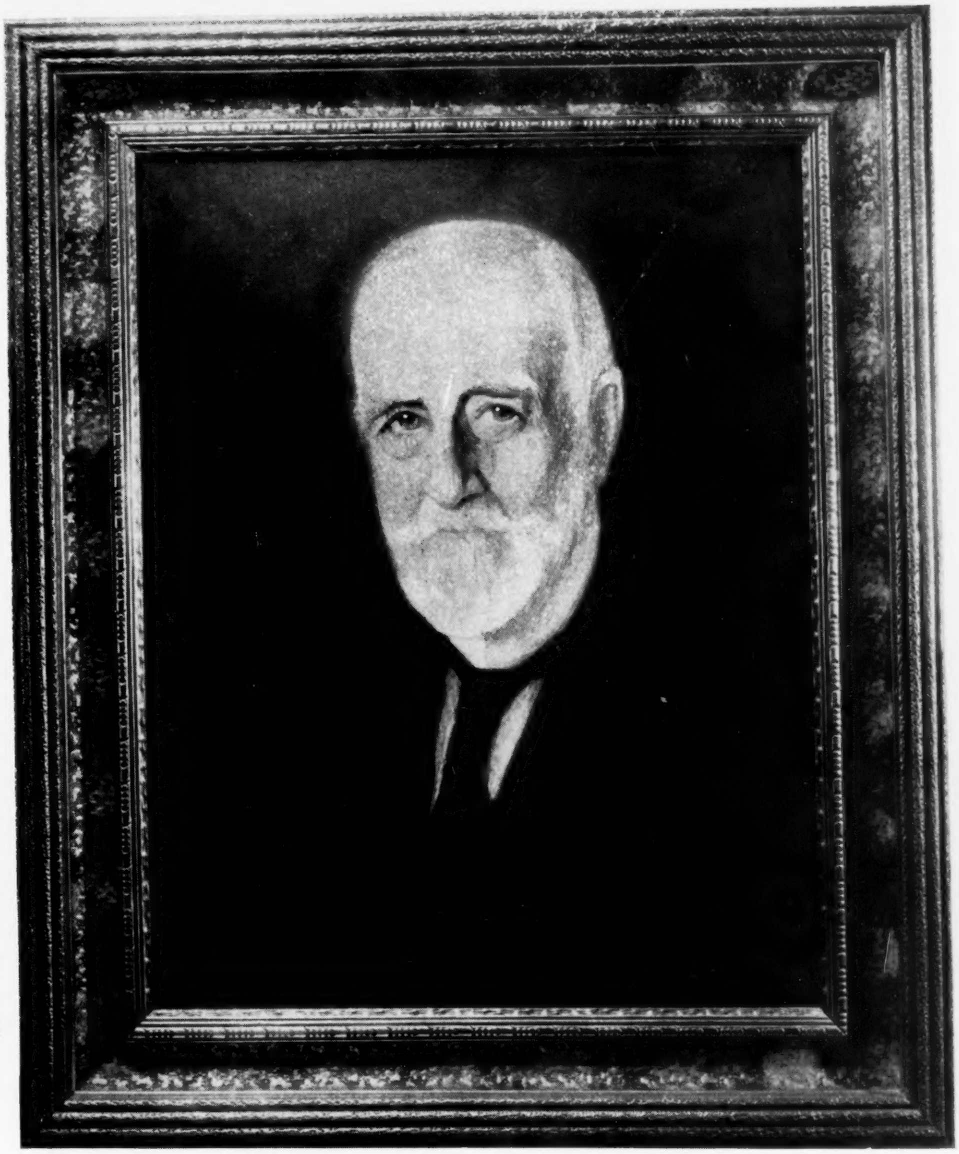
In the early 80's, a young man arrived in San Francisco. A training of several years in the sales department of Solvay, in Europe, had created in him the desire to manufacture chemicals on his own in this new and practically undeveloped field. Because of his early experience with alkalies in Europe, it was natural for John Stauffer to turn to sal-soda as his first manufacturing venture. The simplicity of manufacture led a number of others to turn out the same product, so that competition was probably just as acute fifty years ago as today.

With an unusually analytical mind, however, and with a keen vision of the future, Mr. Stauffer rapidly undertook to exploit other products as soon as funds were available. Whiting, heretofore wholly imported, was produced from English cliffstone in fairly large quantities. At about this time Christian de Guigné, a young citizen of French descent, joined Mr. Stauffer in the business; and to this association, which began before the incorporation of the company in 1895, can be attributed the wonderful success and development of the company. Seldom, indeed, have two men cooperated and worked side by side, and as harmoniously, for over forty years, as have these two. This enduring friendship of the two founders of the Stauffer Chemical Company has been an inspiration to the many hundreds of employees throughout the company's history.

After the first small beginning, other products were gradually manufactured. At that time, the use of chemicals in California was limited; and not a great deal of capital was needed to erect the small factories which were necessary. Sulphuric acid was one of the more commonly used chemicals then, as it is today; and a small chamber plant was erected. With sulphuric acid, it was possible to produce copper sulphate, iron sulphate, hydrochloric acid, etc.

The wine industry in California was flourishing; and

Industry the Coast



Christian de Guigné

the vineyardists were importing from Sicily most of their sulphur for dusting the vines. As the company progressed, it was found profitable to purchase crude sulphur from Japan and sublime the flowers of sulphur which was used exclusively by the vineyardists. In the making of wines there were obtained argols and wine lees; and these were used as a basis for making cream of tartar and tartaric acid. Later carbon bisulphide became one of the products; and as the company grew, its list increased.

With more and more products, the sphere of the company's activities, first confined to the San Francisco Bay region in California, extended to other parts of the United States, and then to Germany, France, Spain, South America, and Australia.

This growth of the Stauffer Chemical Company can be traced to the sound foundation made by the two pioneers, Mr. de Guigné and Mr. Stauffer. Much of the success of the company and many of the progressive steps taken have been due to John Stauffer's foresight. Mr. Stauffer is a product of the old school of the 19th century chemical manufacturers, of whom few are left today; but he combined with the old-fashioned virtues the modern theory of development and progress.

Through the years, affiliations with other leaders in the industry have been made, until today the company's interests are most comprehensive. These affiliations have brought the company into contact with men of the industry who have proven to be more than just business associates. Throughout the long careers of both Mr. Stauffer and Mr. de Guigné, they have tried to make their business personal and to build friendships that were enduring. They believe that a continuation of this policy will always make friends of the purchasers of the company's products instead of just customers, and will make the personnel more than just employees.

The founders of the Stauffer Chemical Company still follow its activities with keen interest. Their kindliness to all, their friendly and cooperative attitude at all times, will long be remembered by their many friends and associates. The Stauffer Chemical Company and its employees are most appreciative of this opportunity to pay this tribute to the founders of the business.

Binney & Smith
and
The Black Art

> ". . . . . and so I foresee the day when the millions of little black demons which once danced as atoms in the flame of natural gas will settle down to the kindly task of easing the shock and vibration of this mechanical age, their strength, arising from their smallness but multiplied by their star-like numbers, reinforcing, preserving and protecting the rubber-substance in which they are embedded, and so making safer and more pleasant the life and journey of man upon the earth."
>
> "The Future of Carbon Black in Rubber Manufacture," by C. Harold Smith—1921.

* * * *

THE prediction referred to in the above quotation has been fulfilled. The intervening fourteen years have seen the improvement of rubber by means of colloidal carbon carried out in the case of pneumatic tire treads, and now also extended to hundreds of supporting members in automobiles, airplanes, trucks, and trains. Thus, overhead as well as underfoot, carbon black is now everywhere recognized as a wonder-worker in the reinforcement of rubber and also in the reinforcement of paint, lacquer, sulphur, and other base materials.

This victory for carbon in the arts of 1935 represents the culmination of two decades of steady and unremitting study and research. It is a source of satisfaction to Binney & Smith Company to have played the leading rôle in this particular industrial drama of the twentieth century.

Early Days

Owing to the fact that from the days of the Egyptian and the Chinese stick ink makers carbon in the form of lampblack had been used solely for its pigmenting qualities, the immediate result of the discovery of impingement carbon from natural gas was a rush into the printing ink and later into the paint industries. While Edwin Binney, of Binney & Smith, wrestled with the problems of manufacture, devising the channel process which now is the standard means of production, C. Harold Smith hastened to place this new material before the ink maker, the paint maker, the paper industry, and countless others, not only in this country but in the farthest corners of the earth. In the three decades from 1880 to 1910 Messrs. Binney and Smith had succeeded in placing this new carbon pigment securely in the saddle and had organized in most countries their own selling offices.

1912—The Great War and a Great Discovery

In the year 1912, there occurred almost simultaneously in England and America one of the greatest discoveries in the rubber industry. It was found that the incorporation of this chemically inert black pigment in sufficient amount toughened the tread rubber of tires to a degree where road mileage was enormously increased. The large Akron tire company which was responsible for the American introduction of the new idea immediately called Binney & Smith into consultation, and plans were rushed for a tremendous increase in output of carbon black.

By 1919 carbon-black compounding in America was already an accomplished fact. For four or five years carbon black had been an essential ingredient in the tire treads of a few of the leading concerns and it was already clear that a new industry was growing up. Carbon was employed in an entirely empirical manner. This was evidenced by the wide variation in dosage and by the combinations with older type pigments which were prevalent at that time and which stand out in retrospect, in striking contrast to the uniformity of tread-compounding practice at the present time.

What was clearly recognized was that the presence, in fairly large amount, of carbon black in the tire tread worked a seeming miracle in prolonging the wear of the tire; and that was indeed enough, requiring as it did the most energetic expansion plans on the part of Binney & Smith Company to keep the black maw of this new giant filled with soot!

What was needed was an improved product especially made and adapted for this new use. The question of grit and of dustiness was energetically attacked by Binney & Smith Company, whose product, then called "inert" black, became the standard used by progressive concerns on both sides of the Atlantic, due to their rapidly increasing confidence in this new tire-tread material.

What was still needed, however, was the rationalization of this new effect. Why was carbon black so much better than previous pigments? How must it be prepared in order to develop its maximum value? Was it

good in all proportions and in all combinations with other pigments? What specific physical or chemical effect did it have on the vulcanized rubber which might explain the increased mileage?

1920—The Science of Reinforcement

The answer to a great many of these questions appeared only a few months after the report from which the above quotation has been taken, and in which these questions were raised. In June, 1920, a scientific paper appeared in which for the first time there was offered a logical explanation of the mechanism of pigment reinforcement of rubber compounds. The author traced the influence of various mineral powders upon the rubber-stress-strain curve and showed that they were increasingly effective according as their particle size diminished.

In the course of this study it was found that the acme of rubber reinforcement, whether measured by resilient energy, modulus of rigidity, tensile strength, or minimum development of vacuoles upon stretching, was attained through the employment of carbon black, the pigment which at the same time showed the smallest particle size.

The author saw fit to refer to this pigment as the king of rubber pigments. *This pigment was actually Micronex Carbon Black.* Binney & Smith were in fact the suppliers of the carbon black employed in the research above referred to. It was at once resolved to employ to the fullest extent the principles thus freshly developed. One of the first steps was to change the name "inert" which, although true chemically, was obviously no longer valid to describe this active pigment which was entirely the opposite of inert in its physical effect on rubber. The name "Micronex" was coined and adopted.

Enthroning the King of Rubber Pigments

The decks were now cleared for action. Binney & Smith set for themselves the objective of seating the new monarch securely and permanently upon his throne, a throne which, however, was vacated only with great reluctance by his blond predecessor, zinc oxide. It was resolved, however, that King Micronex should not be a despotic monarch, that he should never be forced upon an unwilling, because unconvinced, populace. The struggle lasted years during the early twenties and provided a good deal of work, excitement, and sometimes amusement to the management and technologists of Binney & Smith Company.

Meanwhile, the dosage of Micronex was slowly but steadily raised. Back in 1920 theory had indicated that upwards of 40 per cent. on the rubber was necessary to bring out the full reinforcing advantages. It took over five years for the art to overtake the science. Thus, by the close of the decade (1920 to 1930), carbon black had come into its own and was universally adopted in percentages of between 40 and 50 per cent. on the rubber for quality tires everywhere in the world. A strenuous decade, during which time, in addition to blocking out the practical and scientific utility of Micronex, it was also possible to perfect the technique of packing and compression.

Fresh Conquests—Carbon Black as a Colloid

From 1930 on, the efforts of Binney & Smith Company's research workers were concentrated on widening the field of usefulness of carbon black.

The extraordinary adsorption properties of Micronex were applied to the manufacture of electrical insulation. Nowadays, by a strange paradox, carbon black composed of a conducting material is actually used to increase the electrical insulating properties of certain types of rubber compounds—a discovery made in the laboratories of Binney & Smith Company.

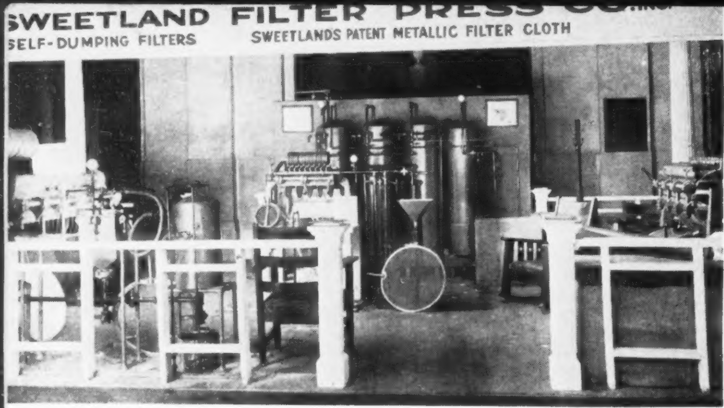
The most important commercial advance since 1930 is the re-orientation of the paint industry through the discovery, by improved methods of dispersion, that high-color carbon blacks could be made greatly to improve the wear resistance and durability of lacquer films and at the same time to displace organic dyes through the improved intensity of black color obtained. Coblac is the commercial name of this development, which is a lacquer base material consisting of the finest quality of carbon, colloidally dispersed in nitrocellulose. This base is now sold in all the important industrial countries in the world.

New grades and new methods of incorporation have now brought the carbon black division of Binney & Smith Company to an impressive variety of specialized products.

There is a carbon black for nearly every purpose—for inks, for paints, for lacquers, for synthetic resins, for electrical insulation, for radio resistances, for sulphur cement, for gramophone records, for water-paint vehicles. Aqueous colloidal suspensions of carbon black have been evolved for medical researches, for rubber latex compounding, for the preparation of black-body radiation devices, for the melting of snow and ice in Arctic climates, for the coloring of textiles and rayons, for the decolorizing of impure solutions, and above all, for the coloring of concrete.

Truly a powerful colloid engine is this carbon black—of great power, withstanding as it does the millions of impacts of the automobile tire; but also of great delicacy, harmless as it is to the most delicate tissues of the human body when injected into the blood stream. A colloid engine also of refined selectivity—the adsorptive qualities of which can now be regulated within fixed limits.

The work continues. New grades and new applications are, even as we write, on the eve of announcement. And a thousand miles southward on limitless plains, are "those slaves of fire who, morn and even," tend the ten million flames which yield carbon, the wonder colloid of the twentieth century.



Exposition Ideas

Create Progress, Future

1915 *AN EXHIBIT OF VITAL IMPORTANCE TO THE INDUSTRY: Still carrying on in the exposition—see next page.*

INDUSTRIAL operations grounded in chemical reactions have unique characteristics. Dealing with chemical changes, they create at every step entirely new products and by-products that are also quite distinct materials. Differences in the processes used to make a given chemical product, even variations in the technique of handling the identical process, often result in marked variations in the costs of the same material made by competitors. They are continually threatened with competition both from new products and improved processes.

Out of these peculiar and difficult conditions governing the basic economics of chemical manufacture arises the imperative necessity of unremitting research. If a chemical enterprise does not go forward, it slips behind.

The conspicuous characteristic of the chemical industries is change. Change is immutable. No other industry changes so rapidly. Of all industrial changes those in the chemical field are the most radical and the farthest reaching in their effects.

Accordingly, progress in the chemical fields has been prodigious. This record of American chemical accomplishment during the past three hundred years seems almost a chronicle of miracles. No other American industry has unfolded so many revolutionary developments. Chemical progress is also progressive, and the expansion of the chemical industries—both in new processes and in new products—has been as great during the past twenty years as the development of the whole preceding century.

This accelerated rate of our chemical development has made the problem of keeping abreast of chemical changes one of increasing difficulty. Nor will the coming years make the task easier. An extremely efficient aid in this hard work of keeping up-to-date has been the Exposition of Chemical Industries. It will be an increasingly valuable tool in the equipment of chemical industrialists, chemical apparatus makers, chemical engineers, chemical research workers, and (last but not least) young chemical students who tomorrow will be our executive and technical leaders.

It was just twenty years ago that the first National Exposition of Chemical Industries was organized. In 1915 we were compelled to be painfully conscious of our chemical shortcomings. Though we had the greatest heavy chemical industry in the world, we had some great and dangerous gaps in our chemical industries. Cut off from the dyes supplied by what was then the monopolistic German Dye Trust, we were threatened with "white cloth." Certain extremely important medicines were lacking. The materials needed for modern explosives and poison gas were not available. There was a virtual famine of potash, and nitrate prices were soaring, so that fertilizers became scarce and costly.

The first Exposition of Chemical Industries back in 1915 showed the needs, the opportunities and the responsibilities of these industries, and developed a public consciousness of what was required to create and maintain a complete self-contained American chemical industry.

Laymen, bankers, consumers, industrialists, all were frankly dubious. When the Exposition actually opened there were 83 exhibitors. These exhibitors showed what was being made and could be supplied. The absences in what should have been a complete line of products, proclaimed the opportunity for men of science, engineering, and finance. Wealth was placed at the command of ability and the short year following saw many manufacturing establishments started to fill in the gaps. Each successive Exposition saw these gaps stopped by the newly created industries.

Since 1915 the Exposition of Chemical Industries has taken an active part in creating and promoting the American Chemical Industries.

By its inspiring leadership it became a vital sales force within the Chemical and related Industries.

Applied Industrially

Development and Wealth

THE EXPOSITION A VITAL SELLING FORCE FOR 20 YEARS: Again presents the exhibit under another name. 1933

The doubts and prejudices of financial men, industrialists, merchants, and consumers were not easily removed, but by gradual education and visualization, they were overcome, and, with the chemical conversion of the law-making bodies, gradually confidence was built up. The earlier expositions awakened the country to a realization of the dangers attending dependence upon foreign sources for nitrogen and potash and for the whole synthetic organic chemical group, products needed as war materials and necessary to peaceful pursuits. Subsequent expositions have continued to dramatize the continuing objectives of the industry, making known the results of its recent researches so that other industries may apply them quickly. It has become a powerful force in shaping the development of chemical engineering. Today, more than ever, it is a useful coordinated agency for bringing the engineer into close working touch with the many new machines and instruments that can increase efficiency and reduce costs.

It has become an educational institution of tremendous importance to executives, operatives, educators, students, and laymen. Inquiring minds correlate the facts and inspiration from one display to another. New uses for a product in one exhibit are suggested by a totally different new development in another booth. And by comprehending the dollar signs which they can search out of the equations in the reactions they visualize, they calculate the employment which they will give to many hands, the satisfaction which the products will bring to many consumers, and the continuing spread of improvement into many industries.

When the Exposition is over, there remains in the minds of those who have seen it a fertile network of mental syñopses from which will bud many new products to contribute to the well-being and happiness of the nation—and contribute more directly to the financial wealth of those who supply the chemicals and apparatus.

Since the chemical industries have firm foundations, however, it is no longer important to interest the layman. Of recent years the Exposition has been a gathering of the industry itself. Beginning with 1923, attendance was limited to those who had industrial connection. With this increased emphasis on the industrial attendance, the attractions for chemical engineers have been increased. In 1925 the American Chemical Society cooperated with a "Court of Chemical Achievement," to present the signally important advances in the science.

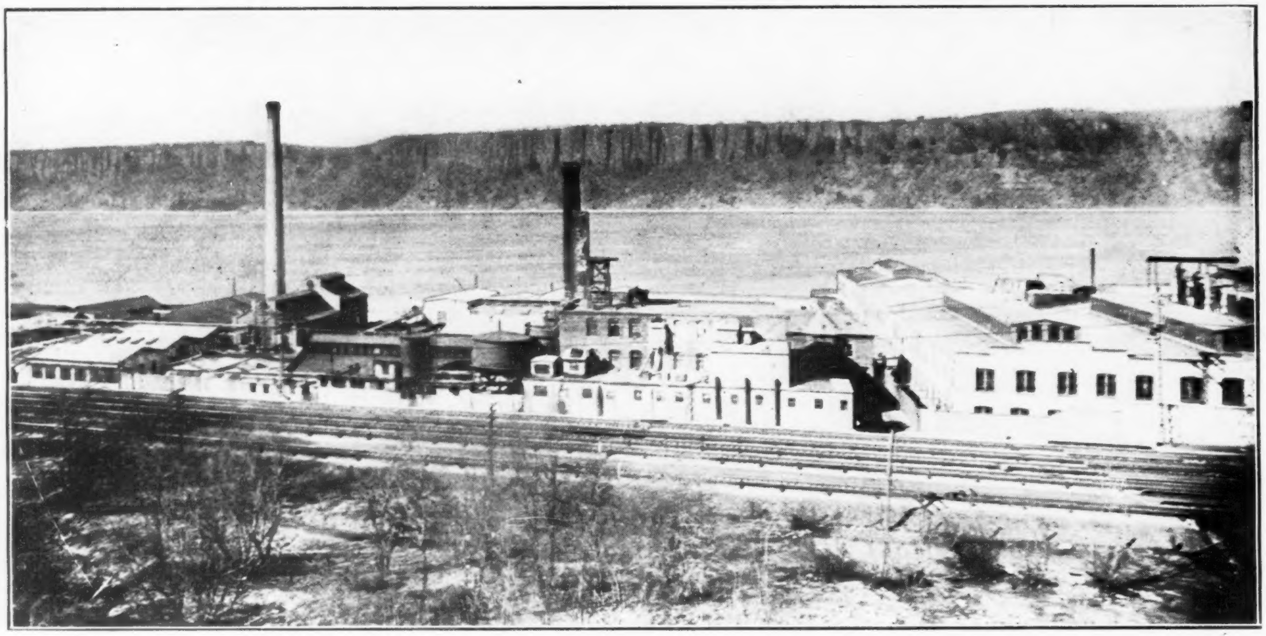
The educational value of the Exposition for students in chemistry was early recognized. In 1920 Professor W. T. Read, at present Dean of Chemistry at Rutgers, but then at Yale, included an intensive week at the Exposition as a regular part of his course in the chemical engineering curriculum. In 1923 a regular student course was organized with Professor Read in charge. Scores of leading engineers and prominent industrialists have served as volunteer lecturers and instructors. Many exhibitors realize the educational importance of the Exposition.

This year the Exposition, during the week of December 3rd, will again present, at the Grand Central Palace, the mighty spectacle of the latest achievements of the chemical and chemical engineering industry. That exhibition will be adapted to the latest of the industry's need, and will serve them as ably as a flexible, experienced organization can serve.

Through the initiative of men of financial, scientific, and industrial ability, science has created industries unknown to an older generation. Those men will go forward creating still more new industries, for by now the methods and the pioneering attitude of chemical industry are secure in America.

Today—with more than one hundred million dollars for new plant projects and accumulated new products to offer

—there is an even more vital selling job for the 1935 Exposition of Chemical Industries to perform.



Pioneer Synthetics Maker

ZINSSER & COMPANY, INC., a firm of manufacturing chemists located at Hastings-on-Hudson, New York, was established in 1897 by August Zinsser, formerly of William Zinsser & Company, of New York City. Mr. Zinsser, together with his son, Dr. F. G. Zinsser, purchased the ground and buildings of a now unknown sugar refinery located directly on the banks of the Hudson River and embarked in the synthetic organic chemical field.

The first venture was tannic acid, and shortly after the erection of this plant, Mr. August Zinsser retired from active participation, turning the business over to his son, Dr. F. G. Zinsser, who has been the active head of the company ever since. Following the work on tannic acid, the Company, under the direction of Dr. Zinsser, enlarged its scope with the manufacture of gallic acids and allied products, such as, hydroquinone, pyrogallol and other photographical materials. Recognizing the need for American manufactured chemicals, Dr. Zinsser enlarged his staff and proceeded with the further development of gallic acid and allied products, branching out into virgin research pertaining to various alizarine and quinizarine dyestuffs, some of which were in production at the beginning of the World War.

With the advent of the war, these later developments were suspended for the more serious business of Chemical Warfare Service. Late in 1917, due to its splendid and favorable location, the United States Government erected a mustard gas plant on the Company's property. Under the direction of the now Colonel F. G. Zinsser, the plant was erected in record time, and at the signing of the Armistice, it was in production in full force.

After the cessation of hostilities, the Company again took up the reins of business and continued its researches in the synthetic organic field. Several processes for the manufacture of alizarine and allied dyestuffs were perfected and put into production, followed by ventures into the azo, basic and acid dyestuff fields. Following this the Company took over the now vacated Government Arsenal buildings and erected plants for the manufacture of such products as alizarine blue blacks, cyanine greens, alizarine asterols, etc., the vast majority of these processes being developed in the Company's spacious research laboratories.

With a desire to enlarge its scope of activities, the Company, in 1926, took over the research laboratories, plant and processes of the Ultro Chemical Company of Brooklyn, early pioneers in the manufacture of high grade color lakes, toners and paint pigments. Under the direction of Mr. H. T. Staber, President and Manager, the entire Ultro unit was moved to Hastings-on-Hudson, where a distinctly modern and efficient dry color plant was erected. The plant was completed and put into production early in 1927, numbering among its many products such items as Hanza Yellows, Toner Orange and Fire Red Toner, the Company being the original manufacturer of this last named product in this country.

Starting with a small plant manufacturing only tannic acid, the Company, through continued research and development, has expanded its operations until it now enjoys an enviable position in the chemical industry, being diversified in scope and in a position to supply the various needs of the textile, paint, ink and photographical industries. At the present time, this Company, with its ideal location, modern buildings and the unsurpassed quality of its products, ranks high in the chemical field of today.

The Chemical Foundation

THE establishment of a self-contained synthetic organic chemical industry in the United States is the only thing of substantial value which we got out of the war. Its establishment meant more to the American people than reparations or territory. It emancipated our research, our medicine, our agriculture and industries, employing millions of men and women and manufacturing billions of dollars of products each year, from the domination and oppression of the German chemical cartel. The value of this industry to the American people is inestimable.

The development of an American synthetic organic chemical industry was made possible by the late President Woodrow Wilson when he gave his approval to the organizing of The Chemical Foundation, Inc., to take over seized German chemical patents. Under the Foundation's charter, American manufacturers were enabled to use these chemical patents on equal terms and conditions. The use of these patents by American chemists was the beginning of a real effort to build up a 100 per cent. self-contained American synthetic organic chemical industry.

President Wilson's Understanding

Our late President knew the great importance of a synthetic organic chemical industry to the United States. He knew that the Germans had placed an embargo on the shipment of needed medicines, dyes, and other chemicals to this country in an attempt to force him to side with Germany in a dispute with England before we entered the war. His interest in the development of a strong industry was intense. He insisted that the work of the Foundation be supplemented by the enactment of legislation placing unusual tariff duties on dyes and related chemicals. President Wilson expressed himself very clearly on this point in a message to Congress less than two months after The Chemical Foundation was organized. He repeated this request in two subsequent messages to Congress.

Every effort was made by the Germans and their allies in this country to prevent the enactment of this legislation. It was a long, hard fight, but the late President's request prevailed. Republicans and Democrats joined together in giving our synthetic organic chemical industry the unusual tariff protection asked for by President Wilson.

The story of the organization of The Chemical Foundation and the reasons which prompted it are best told in the words of Mr. A. Mitchell Palmer who, as Alien Property Custodian, directed the seizure and sale of these chemical patents, in his testimony in court.

It was late in the afternoon of March 3, 1919. Mr. Palmer had just been appointed Attorney General of the United States. As he handed his resignation as Alien Property Custodian to President Wilson, the latter asked him if he had any recommendation to make as to his successor. Mr. Palmer said, in relating the story of the visit:

Garvan Suggested by Palmer

"I told him that I unhesitatingly and very strongly recommend that he appoint Mr. Francis P. Garvan. I then explained to him who Mr. Garvan was, what his duties had been in the Alien Property Custodian's office, and the large extent and great value of his service in that office. I explained to him that I recommended him particularly, because, as I conceived it, the greatest and most important piece of work that we had on hand was the final actual consummation of the Americanization of the German chemical patents, and Garvan, who was more familiar with this situation than anybody in the country, had agreed to become president of The Chemical Foundation without compensation of any kind, which was the instrument that we had created for the purpose of diverting these German chemical patents into general public use for the public benefit in this country, and I considered that so important a piece of constructive work on the part of my department that I was sure that if he agreed with me Garvan was the man to complete it.

"I explained to him again what the chemical situation was, talked to him at length about The Chemical Foundation and what its purposes were, what we had in mind, the great work it could do in being the means of building up a great chemical industry for the advantage of the Government and the people."

"I told him," Mr. Palmer continued, "that at my instance The Chemical Foundation had been formed, and that it had been incorporated, and that the purpose of The Chemical Foundation, according to its charter and according to the agreement which we had with those who were organizing it was to issue non-exclusive licenses for these patents which were conveyed to the Foundation upon fair and reasonable terms to all persons or firms or corporations in the United States who desired to use the same, with the intention of building up a competitive chemical industry in the country.

"That in addition to that it would do such other things as it might be able to in promoting and encouraging the building up of a general chemical industry in the country by educational means and otherwise. I did not have the charter before me and did not undertake to quote it exactly, stating only its broad purposes.

"I told him that in order to secure these purposes and to make certain that all of our plans were carried out not only in the letter but in the spirit in which they were conceived, I had made it a condition that the organization as it started should be named by myself, that its personnel should be of those who had been particularly and intimately associated with the work of investigating the German hold upon the chemical industry in America and those who by reason of that had collaborated with me most closely in building this organization and working out its plan and purpose.

"I explained to him that that was the reason I thought Mr. Garvan ought to be president of the company and that I had directed that he should be elected. I told him that I had insisted with those who put up the money that, contrary to the usual plan, they should not name the directors or the officers, but I would do so and I would see that they were continued, by insisting that all future stock should be trusteed.

"In order to make certain that that trust would be faithfully carried out and that our purposes would be executed by the voting trustees so far as they could, in the control of the corporation through the stock, I suggested as the voting trustees the five persons whom the President himself had appointed, most of whom he personally knew and who had served me as members of the Advisory Sales Committee during our sales program; and that that had all been agreed to and that Mr. Polk had signed the Executive Order and the sale to The Chemical Foundation was an absolute, accomplished and finished fact.

Dr. Charles H. Herty

Mr. Garvan's Outstanding Qualifications

"And that my purpose in urging Mr. Garvan's appointment as Alien Property Custodian was quite largely in view of the fact that he had undertaken to be the president of this corporation without pay and I knew he could be absolutely trusted to carry out its plans and purposes to the letter and in their full spirit. I would not have felt so safe in putting this plan over if I had not been able to pick out from my organization men of that kind who could and would operate it not only as we wanted it to be run but with a patriotic desire to serve their country.

"We had some discussion also about the importance of the chemical industry in war and I told him of the developments which had come to my attention during the war, especially in Germany, which information was to the effect that the great dye factories along the Rhine, which during the War had been combined into one great institution under state guidance, if not control, had been converted during the war into practically munition plants; the by-products of the industry being of great value and importance in the manufacture of high explosives and noxious gases which the Germans had employed to a great extent in the war.

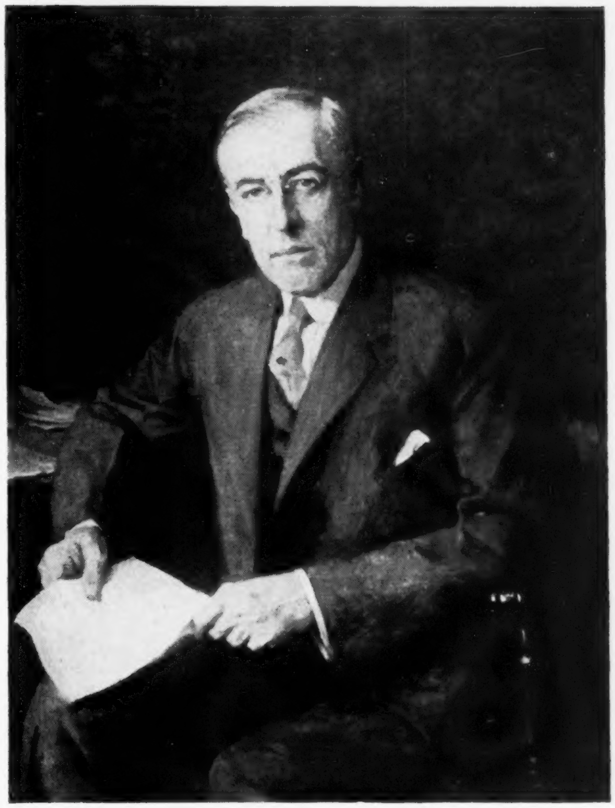
"I expressed the opinion to him that we could never hope to equal that sort of performance, if we ever had to, unless we had a chemical industry of our own in this country; that my information had been that the Germans had a practical monopoly of it not only in

Germany but in the world and certainly in America and that the way to break that monopoly was to carry out the plan that I had worked out.

"In explanation of the manner in which they had been able to control the American monopoly, I explained to him that all of these patents which we had seized had been taken out by the Germans not for the purpose of promoting the development of the chemical industry but for impeding it and that as a general proposition they were used to keep down and destroy the industry in this country, rather than to build it up, in order that the German products might come here and control the market; that that was an additional fact which, in the history of these patents, had led me to have little compunction about taking them from the Germans and selling them to American interests. He was very familiar with the progress of the development of chemistry in the war, particularly in the development of munitions."

It is not amiss at this point to pay tribute to the splendid and untiring efforts of Dr. Charles H. Herty and Mr. Morris A. Poucher in helping Mr. Garvan carry out President Wilson's wishes. They were always on the firing line, ready for any task assigned to them.

When The Chemical Foundation was first organized, both Mr. Palmer and Mr. Garvan would have preferred that it be a government institution. But this apparently was impossible, because an intensive search failed to develop any plan whereby the Government could assume control over the patents taken over with the intention of ultimately building up an American industry.



Woodrow Wilson

Principles of the Foundation

When Mr. Garvan became the president of The Chemical Foundation, he emphasized his understanding that the new organization was a public trust created under the direction of President Wlison for the benefit of the people of the United States. He had impregnated the structure of The Chemical Foundation with his principle from its very beginning, and as a result everything that has been undertaken or accomplished since then has had this principle as its underlying motive.

That public service was the cardinal principle of The Chemical Foundation and has since been upheld and emphasized by the United States Supreme Court in its unanimous opinion upholding the organization of the corporation and its subsequent purchase of the seized German chemical patents. The opinion of the Court was written by Mr. Justice Butler and it said in part:

> The President and under him the Custodian acting for the United States, the seller of the patents, caused the Foundation to be created to buy and hold them and caused it to be controlled by officers or representatives of the United States acting exclusively in its interest. Neither Mr. Garvan nor any of the others who acted for the United States had any financial interest in the Foundation, its profits, or its contracts. All the corporate shares were subscribed and paid for by others—those interested in the chemical industries. They furnished the money to carry out the plan formulated by or under the direction of Mr. Palmer while he was Custodian. Under the Voting Trust Agreement shareholders were divested of all voice in the control business or affairs of the corporation. All shares are to be held by the voting trustees for seventeen years, within which all patents will expire and by charter provisions dividends were limited to 6 per centum per annum. Transferable certificates of beneficial interest were issued by the trustees to the shareholders, but these cannot be used to control the corporation.
>
> The arrangement was intended to amount to a public trust for those whom the patents will benefit and for the promotion of American industries, and to give to them the right to have on equal and reasonable terms licenses to make, use, and sell the inventions covered by the patents. The Foundation is properly to be considered an instrumentality created under the direction of the President to effect that disposition and subsequent control of the patents which he determined to be in the public interest.

The principle of public service which Mr. Garvan laid down for The Chemical Foundation has brought numerous accomplishments which reach far into the health, the industry, the education, the agriculture, and the national safety of the American people. The Foundation has sponsored, stimulated, and supported intensive research in a most substantial manner. It has speeded up the teaching of chemistry and chemical research in the schools, the colleges, and the universities.

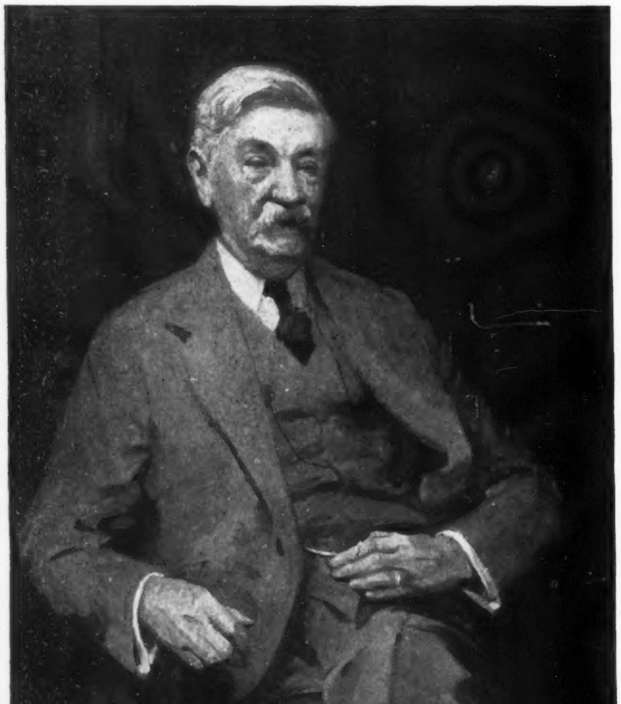
It was quite natural that education in the usefulness and importance of chemistry should become an integral part of the activities of The Chemical Foundation. Unceasing and energetic efforts to inculcate in the public mind the fundamental importance of chemistry to our

health, our industry, our agriculture, and our national safety have resulted in an awakened public opinion. Its persistent and vigorous support of increased and intensive teaching of chemistry and the cooperation between the university and the factory have resulted in the building of many new and magnificent buildings and laboratories by our largest universities.

The stockholders of The Chemical Foundation paid a total of $428,900 for their stock, of which some $269,850 was paid to the Alien Property Custodian for patents, trademarks, and copyrights, and the balance was used as working capital. No stockholder has ever received any dividend or repayment of any kind. Every cent received, outside of the bare office expenses, has been spent in carrying out the obligations of the trust imposed upon it by President Wilson.

The Foundation has financed researches in the following diseases in an endeavor to determine the cause, prevention or cure thereof:

- Common cold
- Leprosy
- Streptococci in the blood
- Tuberculosis
- Cancer
- Sinus
- Pneumonia
- Diabetes
- Children's diseases
- Muscle diseases
- Whooping cough



Morris A. Poucher

Before the war we were absolutely dependent upon Germany for all our biological stains. Since 1921 The Chemical Foundation has furnished $78,886.59 for their discovery, purification, development, and marketing. The work has been done under the supervision of Dr. H. J. Conn of the New York Agricultural Station at Geneva, New York, an institution fostered and encouraged by President Roosevelt while Governor of the State of New York. Dr. Conn has had the benefit of advice and cooperation from the Commission on Standardization of Biological Stains, consisting of representatives of the Society of American Bacteriologists, American Medical Association, American Chemical Society, American Association of Anatomists, American Society of Zoologists, American Association of Pathologists and Bacteriologists, and the Botanical Society of America. Also, of the Department of Agriculture in the United States, which makes the chemical analyses in its laboratories. He also obtained the cooperation of the dye producers who have furnished materials and research without profit. The total business a year in these stains amounts scarcely to $150,000, and the profit to the manufacturers amounts to practically nothing. By this public and private cooperation, our biological stains today are acknowledged the finest in the world, and the people and their physicians and scientists are now served 100 per cent.

The Foundation has also assisted the following fundamental general researches in relation to disease and treatment thereof:

- Research on improved administration and control of anesthesia.
- Bacteriological, pathological, clinical, and historical side of chemo-therapy in relation to disease.
- Isolating active principles of vitamins.
- Colloid chemistry in relation to medicine.
- Characteristics of bacteria.
- Behavior of the proteins.
- Prevention of kidney degeneration.
- Assistance in development of "heavy water."
- Radiological research.
- Fundamental problems of obstetrics and gynecology.
- Financing the production and perfection of biological stains.

The Foundation has assisted financially in the publication of many scientific magazines, such as:

- Journal of Physical Chemistry.
- Journal of Chemical Education.
- Chemical Abstracts.
- The Chemistry Leaflet.
- The Physical Review.
- Reviews of Modern Physics.
- Physics.
- Journal of the Optical Society of America.

The Review of Scientific Instruments with Physics News and Views.
The Journal of the Acoustical Society of America.
The Journal of Chemical Physics.
The American Physics Teacher.
Annual Review of Bio-Chemistry.
Journal of Radiology.
Journal of Rheology.
American Journal of Cancer.
Sewage Works Journal.
Journal of Clinical Investigation.
Technical Studies.

During the war, President Wilson and the members of his official family realized that the great strength of Germany in preparing for the war, in daring to attempt it, and in carrying it on was due to the fact that every man, woman, and child in Germany had been basically and thoroughly educated in the value of chemistry. Therefore, it was early decided between the Government and the industry that our advance would not be safe until our own people had a like understanding; and the Foundation began this educational work through the distribution of popularly written chemistry books, the first of which was Slosson's "Creative Chemistry," of which some 300,000 copies were distributed. In addition, it has distributed large quantities of the following books:

"The Life of Pasteur."
"Discovery. The Spirit and Service of Science."
"What Price Progress?"
"Chemistry and the Home."
"American Chemistry."
"The Romance of Chemistry."
"America Self-Contained."
"A Bubble that Broke the World."
"The Farm Chemurgic."
"The Advance of Science."

A. Mitchell Palmer

It has published itself, in addition to pamphlets:
"Chemistry in Industry"—Two Volumes.
"Chemistry in Agriculture."
"Chemistry in Medicine."
"The Future Independence and Progress of American Medicine in the Age of Chemistry."
"The Significance of Nitrogen."
"The Riddle of the Rhine."

The total distribution of educational literature is in excess of 30 million pieces. This is only part of the story.

A Roster of Important Commercial Chemicals Made in the U. S. A.

Chemicals Produced "Pre-War" Are Designated With An Asterisk

*Accelerators
American Cyanamid & Chemical Corp.
Barrett Co., The
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Acetamide
American Chemical Products Co.
Hooker Electrochemical Co.

*Acetanilid
The Dow Chemical Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Pfizer, Chas. & Co., Inc.

Acetic Anhydride
The Dow Chemical Co.
Mallinckrodt Chemical Works
Union Carbide & Carbon Corp.

Acetic Ether
U. S. Industrial Alcohol Co.

Acetine
American Commercial Alcohol Corp.

Acetoacetanilide
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Acetoacetic Ester
Mallinckrodt Chemical Works

*Acetone
American Commercial Alcohol Corp.
Commercial Solvents Corp.
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.
Wishnick-Tumpeer, Inc.

Acetophenone
Van Dyke & Co.

Acetoxime
American Chemical Products Co.

*Acetphenetidin
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Acetyl Chloride
Hooker Electrochemical Co.

Acetyl Para Toluidine
Pennsylvania Coal Products Co.

Acetylene Tetrabromide
The Dow Chemical Co.

*Acid Acetic
The Grasselli Chemical Co.
Gray, William S. & Co.
Merck & Co., Inc.
Monsanto Chemical Co.
General Chemical Co.
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

Acid Acetic, Glacial
Mallinckrodt Chemical Works

Acid-H Acety
Verona Chemical Co.

Acid Acetyl Salicylic
The Dow Chemical Co.
Heyden Chemical Corp.
Monsanto Chemical Co.
Mallinckrodt Chemical Works

Acid Amino H
National Aniline & Chemical Co., Inc.

Acid Amino J
National Aniline & Chemical Co., Inc.

Acid Amino Naphthol Sulfonic (1:2:4)
National Aniline & Chemical Co., Inc.

Acid Amino Phenol Sulphonic (1:2:5)
National Aniline & Chemical Co., Inc.

Acid Anthranilic
The Dow Chemical Co.

Acid Aqua Fortis
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co.

*Acid Arsenic
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

*Acid Arsenous
Mallinckrodt Chemical Works

*Acid Battery
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Monsanto Chemical Co.

Acid Benzene Sulfonic
Monsanto Chemical Co.

*Acid Benzoic
Carus Chemical Co.
The Dow Chemical Co.
Heyden Chemical Corp.

Acid Benzoic (*Continued*)
Hooker Electro-Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Seydel Chemical Co.

Acid Benzoye Benzoic (Ortho)
National Aniline & Chemical Co., Inc.

*Acid Boric
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pacific Coast Borax Co.
Pfizer, Chas. & Co., Inc.
Stauffer Chemical Co.
Sterling Products Co.
Wishnick-Tumpeer, Inc.

Acid Broenners
National Aniline & Chemical Co., Inc.

Acid Butyric
Merck & Co., Inc.
Union Carbide & Carbon Corp.

Acid Camphoric
Mallinckrodt Chemical Works

*Acid Carbolic
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Wishnick-Tumpeer, Inc.

*Acid Carbonic
Monsanto Chemical Co.

Acid Caproic
Mallinckrodt Chemical Works

Acid Cassella
National Aniline & Chemical Co., Inc.

Acid Chicago (SS Acid)
National Aniline & Chemical Co., Inc.

Acid Chlorosulfonic
The Grasselli Chemical Co.

Acid Chlorsulfonic
Monsanto Chemical Co.

*Acid Chromic
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
The Martin Dennis Co.
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Acid Chromotropic
National Aniline & Chemical Co., Inc.

*Acid Citric
California Fruit Growers Exchange
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Acid Citric Anhydrous
Pfizer, Chas. & Co., Inc.

Acid Cleves (1:6-1:7 and Mixed)
National Aniline & Chemical Co., Inc.

Acid Colors
E. I. du Pont de Nemours & Co.
The Calco Chemical Co., Inc.
John D. Lewis, Inc.
National Aniline & Chemical Co., Inc.

Acid Cresotinic
Monsanto Chemical Co.

Acid Cresylic
Barrett Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Acid Dichloracetic
The Dow Chemical Co.

Acid Diethylbarbiturate
Mallinckrodt Chemical Works

Acid Dinitrostilbene Disulfonic
National Aniline & Chemical Co., Inc.

Acid Dyes
E. I. du Pont de Nemours & Co.
Calco Chemical Co.
John D. Lewis
National Aniline & Chemical Co., Inc.

*Acid Electrolyte
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

Acid Epsilon
National Aniline & Chemical Co., Inc.

Acid Ethyl Benzl Aniline Sulfonic
National Aniline & Chemical Co., Inc.

*Acid Formic
E. I. du Pont de Nemours & Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Victor Chemical Works

Acid Fumaric
National Aniline & Chemical Co., Inc.

Acid Fuming
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

*Acid Gallic
Mallinckrodt Chemical Works
Merck & Co., Inc.
Zinsser & Co.

Acid Gamma
National Aniline & Chemical Co., Inc.

Acid Gluconic
Pfizer, Chas. & Co., Inc.

Acid Gluconic, Lactone
Pfizer, Chas. & Co., Inc.

*Acid Glycerophosphoric
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Acid H
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.

Acid Hydriodic
Mallinckrodt Chemical Works

Acid Hydrobromic
The Dow Chemical Co.
Mallinckrodt Chemical Co.

*Acid Hydrochloric
The Dow Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pennsylvania Salt Mfk. Co.
Stauffer Chemical Co.

Acid Hydrocyanic
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works

*Acid Hydrofluoric
General Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Sterling Products Co.

Acid Hydrofluosilicic
Pennsylvania Salt Mfg. Co.
Sterling Products Co.

Acids, Hydroxy Fatty Co.
American Chemical Products Co.

Acid Hypophosphorus
Mallinckrodt Chemical Works

Acid Iodic
Mallinckrodt Chemical Works

Acid J
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Acid Koch
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Acid L
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

*Acid Lactic
E. I. du Pont de Nemours & Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Acid Laurents
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc .

Acid Maleic
American Cyanamid & Chemical Corp.
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.

Acid Malic
National Aniline & Chemical Co., Inc.

Acid Metanilic
National Aniline & Chemical Co., Inc.

Acid Meta Phenylene Diamine and Sulfo
National Aniline & Chemical Co., Inc.

Acid Meta Toluylene Diamine and Sulfo
National Aniline & Chemical Co., Inc.

*Acid Mixed
American Cyanamid & Chemical Corp.
The Calco Chemical Co.
General Chemical Co.
The Grasselli Chemical Co.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

*Acid Molybdic
Mallinckrodt Chemical Works
Merck & Co., Inc.

Acid Monchloracetic
The Dow Chemical Co.
Mallinckrodt Chemical Works

*Acid Muriatic
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Hooker Electrochemical Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.
Niagara Alkali Co.
Stauffer Chemical Co.

Acid Neville-Winters
National Aniline & Chemical Co., Inc.

*Acid Nitric
American Cyanamid & Chemical Corp.
The Calco Chemical Co., Inc.
E. I. du Pont de Nemours & Co.
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

Acid Nitro-Hydrochloric
Mallinckrodt Chemical Works

*Acid Oleic
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

*Acids Oleum
The Calco Chemical Co., Inc.
General Chemical Co.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

Acid Orthochloranilidacetoacetic
Verona Chemical Co.

Acid Ortho Chlor Benzoic
National Aniline & Chemical Co., Inc.

*Acid Orthocresotinic
The Dow Chemical Co.
Heyden Chemical Corp.

*Acid Oxalic
General Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Victor Chemical Works
Wishnick-Tumpeer, Inc.

Acid P-Aminodiphenylamineosulfonic
Verona Chemical Co.

Acid Para Amino Benzoic
Seydel Chemical Co.

Acid Para Hydroxy Benzoic
Seydel Chemical Co.

Acid Paranitraniline Orthosulfonic
Verona Chemical Co.

Acid Para Nitro Benzoic
Seydel Chemical Co.

Acid Paranitrochlorbenzene-orthosulfonic
Verona Chemical Co.

Acid Paratoluylbenzoic
Calco Chemical Co.

Acid Perchloric
Mallinckrodt Chemical Works

Acid Peri
National Aniline & Chemical Co., Inc.

Acid Perosmic
Mallinckrodt Chemical Works

Acid Phenyl J
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Acid Phenyl Peri
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Acid Phosphomolybdic
American Chemical Products Co.
Mallinckrodt Chemical Works

***Acid Phosphoric**
General Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Victor Chemical Works
Warner Chemical Co.

***Acid Phosphoric Paste**
Victor Chemical Works
Warner Chemical Co.

Acid Phosphotungstic
American Chemical Products Co.
Mallinckrodt Chemical Works

Acid Phthalic
Mallinckrodt Chemical Works

***Acid Picklers**
General Chemical Co.
The Grasselli Chemical Co.
Monsanto Chemical Co.

Acid Picric
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works

Acid Picramic
E. I. du Pont de Nemours & Co.
The Calco Chemical Co.

Acid Potassium Fluoride
Merck & Co., Inc.

Acid Proof Cement
Pennsylvania Salt Mfg. Co.

Acid Pumps
Eimer & Amend

***Acid Pyrogallic**
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Zinsser & Co.

***Acid Pyroligneous**
Merck & Co., Inc.

Acid Pyrophosphoric
Victor Chemical Works

Acid Recinoleic
American Chemical Products Co.

Acid S
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Acid SS (Chicago Acid)
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

***Acid Salicyclic**
The Dow Chemical Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.

Acid Schoellkopf
National Aniline & Chemical Co., Inc.

Acid Sebacic
American Chemical Products Co.

Acid Silicic
Mallinckrodt Chemical Works

***Acid Sodium Phosphate**
Victor Chemical Works
Warner Chemical Co.

***Acid Sodium Phosphate Pyro**
General Chemical Co.
Victor Chemical Works
Warner Chemical Co.

***Acid Stearic**
Binney & Smith Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Acid Succinic
American Cyanamid & Chemical Corp.
Mallinckrodt Chemical Works
National Aniline & Chemical Co., Inc.
Seydel Chemical Co.

***Acid Sulfanilic**
E. I. du Pont de Nemours & Co.
The Calco Chemical Co.
Mallinckrodt Chemical Works
National Aniline & Chemical Co., Inc.
Verona Chemical Co.

Acid Sulfo-carbolic
Mallinckrodt Chemical Works

Acid Sulfonic Mono
The Calco Chemical Co., Inc.

Acid Sulfo-salicylic
Mallinckrodt Chemical Works

***Acid Sulfuric**
American Cyanamid & Chemical Corp.
Ducktown Chemical & Iron Co.
The Calco Chemical Co., Inc.
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

***Acid Sulfurous**
Merck & Co., Inc.
Mallinckrodt Chemical Works

***Acid Tannic**
Innis Speiden Co.
John D. Lewis, Inc.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.
Zinsser & Co.

Acid Tar
Monsanto Chemical Co.

***Acid Tartaric**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.
Stauffer Chemical Co.

Acid Tobias
E. I. du Pont de Nemours & Co.
The Calco Chemical Co.

Acid Toige Peri
National Aniline & Chemical Co., Inc.

Acid Trichloracetic
The Dow Chemical Co.
Mallinckrodt Chemical Works

Acid Tungstic
American Chemical Products Co.

Acids Vegetable Fatty
American Chemical Products Co.

Acriflavine
National Aniline & Chemical Co., Inc.
Seydel Chemical Co.

Activated Carbon
Union Carbide & Carbon Corp.

***Adeps Lanae**
Merck & Co., Inc.

***Adhesives**
Binney & Smith Co.

***Agar Agar**
Merck & Co., Inc.

Agaricin
Mallinckrodt Chemical Works

***Agricultural Dusts**
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Mechling Bros. Chemical Co.

***Agricultural Sprays**
General Chemical Co.
The Grasselli Chemical Co.
Mechling Bros. Chemical Co.

Air Testing Apparatus
Eimer & Amend

***Albumen, Egg**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Albuminometers
Eimer & Amend

Albusol
Mallinckrodt Chemical Works

***Alcohol**
American Commercial Alcohol Corp.
E. I. du Pont de Nemours & Co.
Gray, William S. & Co.
Hamilton, A. K.
Mallinckrodt Chemical Works
Monsanto Chemical Co.
Pennsylvania Alcohol Corp.
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Alcohol Aldehyde
Mallinckrodt Chemical Works

Alcohol Aloin
Mallinckrodt Chemical Works

Alcohol, Amyl
American Commercial Alcohol Corp.
Commercial Solvents Corp.
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
U. S. Industrial Alcohol Co.

***Alcohol, Amyl Iso**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Alcohol, Amyl Secondary
American Commercial Alcohol Corp.
U. S. Industrial Alcohol Co.

Alcohol, Benzyl
American Chemical Products Co.
E. I. du Pont de Nemours & Co.
Hooker Electrochemical Co.
Monsanto Chemical Co.
Seydel Chemical Co.
Van Dyke & Co.

Alcohol, Butyl
The Commercial Solvents Corp.
Hamilton, A. K.
Mallinckrodt Chemical Co.
Pennsylvania Alcohol Corp.
U. S. Industrial Alcohol Co.

Alcohol, Butyl Secondary
American Commercial Alcohol Corp.
U. S. Industrial Alcohol Co.

Alcohol, Capryl
American Chemical Products Co.

Alcohol, Cetyl
Van Dyke & Co.

Alcohol, Diacetone
Commercial Solvents Corp.
Monsanto Chemical Co.

Alcohol Ethyl Butyl
Union Carbide & Carbon Corp.

Alcohol, Isoamyl
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.

Alcohol, Isobutyl
E. I. du Pont de Nemours & Co.

Alcohol, Isopropyl
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.

Alcohol, Methyl Amyl
Union Carbide & Carbon Corp.

Alcohol, Phenyl Ethyl
E. I. du Pont de Nemours & Co.
The Dow Chemical Co.
Van Dyke & Co.

Alcohol, Popyl Iso
Mallinckrodt Chemical Works

Alcohol, Octyl
Union Carbide & Carbon Corp.

Alcohol Octyl, Secondary
American Chemical Products Co.

Alcohol, Sulphonated Fatty
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co.
Wolf, Jacques & Co.

Alizarin
The Calco Chemical Co.
National Aniline & Chemical Co.

Alizarine Yellows
Wolf, Jacques & Co.

AlphaAlphaDinaphthol
American Chemical Products Co.

Alpha-chlornaphthalene
Hooker Electrochemical Co.

Alpha Dinitro Phenol—Free Acid
National Aniline & Chemical Co., Inc.

Alpha Dinitro Phenol-Sodium Salt
National Aniline & Chemical Co., Inc.

Alphanaphthol
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Alpha Naphthylamine
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

***Alum, Ammonia**
American Cyanamid & Chemical Corp.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Pennsylvania Salt Mfg. Co.
Wishnick-Tumpeer, Inc.

Alum, Chrome-Ammonia
Mallinckrodt Chemical Works
Verona Chemical Co.

Alum, Chrome-Potassium
Mallinckrodt Chemical Works
Verona Chemical Co.

Alum, Filter
American Cyanamid & Chemical Corp.
The Grasselli Chemical Co.
General Chemical Co.
Pennsylvania Salt Mfg. Co.

Alum, Paper Makers'
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.

Alum, Pearl
General Chemical Co.
The Grasselli Chemical Co.
Pennsylvania Salt Mfg. Co.

Alum, Photographic
Mallinckrodt Chemical Works

Alum, Potassium
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

***Alums**
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.

Aluminating Gas
Union Carbide & Carbon Corp.

***Aluminum**
Merck & Co., Inc.

***Aluminum Acetate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Aluminum Aceto-Tartrate
Mallinckrodt Chemical Works

Aluminum Benzoate
Seydel Chemical Co.

***Aluminum Chloride**
American Cyanamid & Chemical Corp.
The Grasselli Chemical Co.
Hooker Electrochemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.

Aluminum Citrate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Aluminum Formate
Victor Chemical Works

***Alumina Hydrate**
H. Kohnstamm & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pennsylvania Salt Mfg. Co.
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

Aluminum Hydroxide-Gel
National Aluminate Corp.

***Aluminum Metal**
Mallinckrodt Chemical Works

Aluminum Nitrate
Mallinckrodt Chemical Works

***Aluminum Oxide**
Pennsylvania Salt Mfg. Co.

***Aluminum Phosphate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Aluminum Stearate
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

Aluminate Subacetate Solution
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Aluminum Sulfate**
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
Wishnick-Tumpeer, Inc.

Amidopyrine
Mallinckrodt Chemical Works
National Aniline & Chemical Co., Inc.

Amines
E. I. du Pont de Nemours & Co.
American Chemical Products Co.

Aminoazobenzene
E. I. du Pont de Nemours & Co.
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

Aminoazobenzene Hydrochloride
National Aniline & Chemical Co., Inc.

Amino Azo Toluene Base
E. I. du Pont de Nemours & Co.
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

Aminocaine
Seydel Chemical Co.

Amino G. Salt
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

*Ammonia Anhydrous
Bower, Henry Chemical Mfg. Co.
E. I. du Pont de Nemours & Co.
Mathieson Alkali Works, Inc.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.

*Ammonia, Aqua
American Cyanamid & Chemical Corp.
Bower, Henry Chemical Mfg. Co.
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Mathieson Alkali Works, Inc.
Merck & Co., Inc.
Monsanto Chemical Co.

*Ammonium Acetate
American Chemical Products Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

*Ammonium Arsenate
Mallinckrodt Chemical Works

*Ammonium Benzoate
Hooker Electrochemical Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.
Seydel Chemical Co.

*Ammonium Bicarbonate
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

*Ammonium Bichromate
Mallinckrodt Chemical Works
Merck & Co., Inc.

*Ammonium Bifluoride
Mallinckrodt Chemical Works
Merck & Co., Inc.
Sterling Products Co.

*Ammonium Bisulphate
Mallinckrodt Chemical Works

*Ammonium Borate
Mallinckrodt Chemical Works
Sterling Products Co.

*Ammonium Bromide
The Dow Chemical Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

*Ammonium Carbonate
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

*Ammonium Chloride
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pennsylvania Salt Mfg. Co.

*Ammonium Chromate
Mallinckrodt Chemical Works

*Ammonium Citrate
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

*Ammonium Fluoride
Mallinckrodt Chemical Works
Merck & Co., Inc.

Ammonium Gluconate
Pfizer, Chas. & Co., Inc.

Ammonium Glycerophosphate, Pure
Heyden Chemical Corp.
Mallinckrodt Chemical Works

*Ammonium Hydroxide
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.

*Ammonium Hypoposphite
Mallinckrodt Chemical Works

*Ammonium Iodide
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Ammonium Molybdate
Mallinckrodt Chemical Works

*Ammonium Nitrate
Mallinckrodt Chemical Works
Merck & Co., Inc.

*Ammonium Nitrite
Mallinckrodt Chemical Works

*Ammonium Oxalate
Mallinckrodt Chemical Works
Merck & Co., Inc.
Sterling Products Co.

Ammonium Persulfate
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pennsylvania Salt Mfg. Co.

Ammonium Phosphate-Dibasic
General Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Ammonium Phosphate—Monobasic
General Chemical Co.
Mallinckrodt Chemical Works

Ammonium Phosphomolybdate
American Chemical Products Co.

Ammonium Phosphotungstate
American Chemical Products Co.

Ammonium Salicylate
The Dow Chemical Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Monsanto Chemical Co.

*Ammonium Sulfate
Barrett Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Ammonium Sulfide
General Chemical Co.
The Grasselli Chemical Co.
Mathieson Alkali Works, Inc.
Mallinckrodt Chemical Works

Ammonium Sulfocyanate
Mallinckrodt Chemical Works
Merck & Co., Inc.

*Ammonium Tartrate
Mallinckrodt Chemical Works
Merck & Co., Inc.

Ammonium Thiocyanate
Mallinckrodt Chemical Works

Ammonium Valerate
Mallinckrodt Chemical Works

Ammonium and Magnesium Phosphate
Mallinckrodt Chemical Works

Ammonium and Magnesium Sulfate
Mallinckrodt Chemical Works

Ammonium and Potassium Tartrate
Mallinckrodt Chemical Works

*Amyl Acetate
American Commercial Alcohol Corp.
The Commercial Solvents Corp.
E. I. du Pont de Nemours & Co.
Franco-American Chemical Works
Hamilton, A. K.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
U. S. Industrial Alcohol Co.

Amyl Aniline
Mallinckrodt Chemical Works

Amyl Benzoate
Seydel Chemical Co.

Amyl Butyrate
E. I. du Pont de Nemours & Co.
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.

Amyl Formate
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.

Amy Hydrochloride
Mallinckrodt Chemical Works

Amyl Propionate
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.
U. S. Industrial Alcohol Co.

Amyl Salicylate
Van Dyke & Co.

Anhydroformaldehyde Aniline
The Calco Chemical Co., Inc.
Monsanto Chemical Co.

***Aniline**
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
The Dow Chemical Co.
National Aniline & Chemical Co., Inc.

Aniline Hydrochloride
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

***Animal Sprays and Spray Base Oils**
Barrett Co.

***Anodes**
The Grasselli Chemical Co.

Anthracene
American Cyanamid & Chemical Corp.
Barrett Co.
Monsanto Chemical Co.

Anthraquinone
American Cyanamid & Chemical Corp.
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

Anthrarufin
National Aniline & Chemical Co., Inc.

Anti-Foams
American Chemical Products Co.
American Cyanamid & Chemical Corp.
Barrett Co.
General Chemical Co.
Monsanto Chemical Co.
National Oil Products Co.

Anti-freeze
American Commercial Alcohol Corp.
The Commercial Solvents Corp.
Gray, William S. & Co.
Hamilton, A. K.
Pennsylvania Alcohol Corp.
Sterling Products Co.
Union Carbide & Carbon Corp.

Antimol
Seydel Chemical Co.

***Antimony**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Antimony Chloride**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Antimony Lactate
John D. Lewis, Inc.

***Antimony Oxide**
John D. Lewis, Inc.
Wishnick-Tumpeer, Inc.

***Antimony Salts**
John D. Lewis, Inc.
Sterling Products Co.

***Antimony Sulfide**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

***Antimony Trichloride**
Hooker Electrochemical Co.

Anti-Oxidants
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
Barrett Co.
Monsanto Chemical Co.

Antipyrine
The Dow Chemical Co.
Mallinckrodt Chemical Works

Antipyrine Benzoate
Seydel Chemical Co.

***Antiseptic Compounds**
Monsanto Chemical Co.
Seydel Chemical Co.

Apiol, Liquid
Mallinckrodt Chemical Works

Apomorphine Hydrochloride
Mallinckrodt Chemical Works

Arecoline Hydrobromide
Mallinckrodt Chemical Works

***Arsenic**
Mallinckrodt Chemical Works
Merck & Co.

Arsenic Iodide
Pfizer, Chas. & Co., Inc.

Arsenic Pentoxide
Mallinckrodt Chemical Works

***Arsenic Red**
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

***Arsenic Sulfide Yellow**
Mallinckrodt Chemical Works

Arsenic Trichloride
Hooker Electrochemical Co.

Arsenic Trioxide
Mallinckrodt Chemical Works

***Arsenic White**
Merck & Co., Inc.

Arsenous Bromide
Mallinckrodt Chemical Works

Arsenous Iodide
Mallinckrodt Chemical Works

Arsenous and Mercuric Iodide
Mallinckrodt Chemical Works

Arsphenamine
Mallinckrodt Chemical Works

Artificial Fruit Esters
E. I. du Pont de Nemours & Co.
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.

Artificial Leather Colors
Binney & Smith Co.
The Calco Chemical Co.
National Aniline & Chemical Co.

***Asphalt**
Wishnick-Tumpeer, Inc.

Asphalt Testing Apparatus
Eimer & Amend

Aspidospermine Alkaloid
Mallinckrodt Chemical Works

Atropine Alkaloid
Mallinckrodt Chemical Works

Atropine Sulfate
Mallinckrodt Chemical Works
Seydel Chemical Co.

Aubepine
Van Dyke & Co.

Azolitmin
Mallinckrodt Chemical Works

Bacteria Counters
Eimer & Amend

Balances and Weights
Eimer & Amend

Barbital
Seydel Chemical Co.

Barbital Acid Diethylbarbituric
Mallinckrodt Chemical Works

Barbital Sodium
Seydel Chemical Co.

Barbital Soluble
Mallinckrodt Chemical Works

***Barium Acetate**
Mallinckrodt Chemical Works
Sterling Products Co.

Barium Aluminate
National Aluminate Corp.

Barium Benzoato
Seydel Chemical Co.

Barium Bromate
Mallinckrodt Chemical Works

***Barium Bromide**
The Dow Chemical Co.
Mallinckrodt Chemical Works

***Barium Carbonate**
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

***Barium Chloride**
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

***Barium Chromate**
Mallinckrodt Chemical Works
Sterling Products Co.

***Barium Dioxide**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Barium Fluosilicate
E. I. du Pont de Nemours & Co.
The Grasselli Chemical Co.

***Barium Hydrate**
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

***Barium Nitrate**
Mallinckrodt Chemical Works

Barium Permanganate
Carus Chemical Co.

***Barium Peroxide**
Mallinckrodt Chemical Works
Warner Chemical Co.

***Barium Sulfate**
American Cyanamid & Chemical Corp.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

***Barium Sulfide**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Barium Sulfite**
Mallinckrodt Chemical Works

***Barometers**
Eimer & Amend

***Barytes, Dry-ground**
Wishnick-Tumpeer, Inc.

***Barytes, Water-ground**
Wishnick-Tumpeer, Inc.

Basic Colors
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

***Bates-Tanners**
American Cyanamid & Chemical Corp.
The Martin Dennis Co.
National Oil Products Co.
Wolf, Jacques & Co.

***Battery Salt**
Warner Chemical Co.

Bauxite
American Cyanamid & Chemical Corp.

***Belt Cement**
Monsanto Chemical Co.

Benacol
Seydel Chemical Co.

***Bentonite**
Wishnick-Tumpeer, Inc.

Benzadine Base Distilled
National Aniline & Chemical Co., Inc.

Benzal Chloride
Heyden Chemical Corp.

Benzalco
Seydel Chemical Co.

Benzaldehyde
General Chemical Co.
Heyden Chemical Corp.
Merck & Co., Inc.

Benzanthrone
National Aniline & Chemical Co., Inc.

Benzidine
American Chemical Products Co.

Benzidine Hydrochloride
American Chemical Products Co.

Benzidine Sulphate
American Chemical Products Co.

Benzocaine
Mallinckrodt Chemical Works
Seydel Chemical Co.

Benzocaine Benzoate
Seydel Chemical Co.

Benzocaine Tannate
Seydel Chemical Co.

Benzoic Anhydride
Hooker Electrochemical Co.

***Benzol**
Barrett Co.
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Benzophenone
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Benzotrichloride
Heyden Chemical Corp.
Hooker Electrochemical Co.

***Benzoyl Chloride**
The Dow Chemical Co.
Heyden Chemical Corp.
Hooker Electrochemical Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Benzoyl Peroxide
Seydel Chemical Co.

Benzyl Acetate
Van Dyk & Co.

Benzyl Benzoate
American Chemical Products Co.
Mallinckrodt Chemical Works
Seydel Chemical Co.
Van Dyk & Co.

Benzyl Chloride
Heyden Chemical Corp.
Hooker Electrochemical Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Benzyl Cinnamate
Van Dyk & Co.

Benzyl Saliccylate
Van Dyk & Co.

Benzyl Succinate
Seydel Chemical Co.

Berberine Hydrochloride
Mallinckrodt Chemical Works

Berberine Sulfate, Acid
Mallinckrodt Chemical Works

Berberine Sulfate, Neutral
Mallinckrodt Chemical Works

Bernay's Mixture
Pfizer, Chas. & Co., Inc.

Beta Amino Anthraquinone
National Aniline & Chemical Co., Inc.

***Betanaphthol**
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Betanaphthol Benzoate
Mallinckrodt Chemical Works

Beta Naphthylamine
National Aniline & Chemical Co., Inc.

***Bismuth**
Merck & Co., Inc.
Mallinckrodt Chemical Works

Bismuth Metal
Pfizer, Chas. & Co., Inc.

Bismuth Benzoate
Seydel Chemical Co.

Bismuth Beta-Naphthol
Mallinckrodt Chemical Works

Bismuth Chloride
Mallinckrodt Chemical Works

Bismuth Citrate
Mallinckrodt Chemical Works

Bismuth Hydroxide
Mallinckrodt Chemical Works

Bismuth Lactate
Mallinckrodt Chemical Works

***Bismuth Nitrate**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

***Bismuth Oxide**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

***Bismuth Oxychloride**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Bismuth Phosphate
Mallinckrodt Chemical Works

Bismuth Salicylate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Bismuth Salts
Mallinckrodt Chemical Works
Merck & Co., Inc.
New York Quinine & Chemical Works

***Bismuth Subbenzoate**
Mallinckrodt Chemical Works

Bismuth Sub-Benzoato
Seydel Chemical Co.

***Bismuth Subcarbonate**
Mallinckrodt Chemical Works
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

Bismuth Subgallate
Mallinckrodt Chemical Works
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

Bismuth Subiodide
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

***Bismuth Subnitrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

Bismuth Subsalicylate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Bismuth Sulfo-carbolate
Mallinckrodt Chemical Works

Bismuth Tannate
Mallinckrodt Chemical Works

Bismuth and Ammonium Citrate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

***Black Metal Paint**
Barrett Co.

***Blackboard Crayon**
Binney & Smith Co.

***Blanc Fixe**
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

***Blanc Range**
Innis Speiden & Co.

Bland's Mass
Mallinckrodt Chemical Works

***Bleach**
H. Kohnstamm & Co.
Seydel Chemical Co.

Bleach Testers
Eimer & Amend

***Bleaching Agents**
Mathieson Alkali Works
H. Kohnstamm & Co.
Pennsylvania Salt Mfg. Co.

Ammonium Persulphate
Pennsylvania Salt Mfg. Co.

***Bleaching Powder**
Hooker Electrochemical Co.
Mathieson Alkali Works, Inc.
Niagara Alkali Co.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
Wishnick-Tumpeer, Inc.

***Block Printing Ink and Reducer**
Binney & Smith Co.

Blood Testing Apparatus
Eimer & Amend

Blue Mass
Mallinckrodt Chemical Works

Blue Ointment
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Blue Pill
Pfizer, Chas. & Co., Inc.

***Boiling Out Agents**
American Cyanamid & Chemical Corp.
Seydel Chemical Co.
Wolf & Co., Jacques

***Bone Black**
Binney & Smith Co.

***Bone Charcoal**
Stauffer Chemical Co.

***Bone Coal**
Mallinckrodt Chemical Works

***Bone Meal**
Stauffer Chemical Co.

***Borax**
Gray, William S. & Co.
Merck & Co., Inc.

***Borax (*Continued*)**
Pacific Coast Borax Co.
Pfizer, Chas. & Co., Inc.
Stauffer Chemical Co.
Sterling Products Co.
Wishnick-Tumpeer, Inc.

Borax Glass
Mallinckrodt Chemical Works
Stauffer Chemical Co.

***Bordeaux Mixture**
General Chemical Co.
The Grasselli Chemical Co.
Mechling Bros. Chemical Co.

Bottles, Aspirator
Eimer & Amend

Bottles, Reagent
Eimer & Amend

Bottles, Specific Gravity
Eimer & Amend

Bottles, Weighing
Eimer & Amend

Bottlers' Juices
California Fruit Growers Exchange

***Brake Lining Saturants**
Barrett Co.

***Brimstone**
Freeport Sulphur Co.
Stauffer Chemical Co.
Texas Gulf Sulphur Co., Inc.

***Bromine**
The Dow Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Warner Chemical Co.

***Bromoform**
Mallinckrodt Chemical Works
The Dow Chemical Co.

2—Brom Paraxenol
The Dow Chemical Co.

***Bronzing Liquids**
Monsanto Chemical Co.

Brown Styral
Van Dyk & Co.

***Brucine**
Merck & Co., Inc.

Brucine Alkaloid
Mallinckrodt Chemical Works
Merck & Co., Inc.
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

***Brucine Sulfate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

Brushing Lacquers
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Brushing Lacquer Solutions
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Burettes
Eimer & Amend

Butalyde
The Commercial Solvents Corp.

Butane
Union Carbide & Carbon Corp.

Butyl Acetate
The Commercial Solvents Corp.
Franco-American Chemical Works
Hamilton, A. K.
Monsanto Chemical Co.
Pennsylvania Alcohol Corp.
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Butyl Acetate Normal
American Commercial Alcohol Corp.

Butyl Acetate Secondary
American Commercial Alcohol Corp.

Butyl Acetyl Ricinoleate
The Commercial Solvents Corp.

n-Butyl Bromide
American Chemical Products Co.

Butyl Butyrate
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.

Butyl Carbitol
Union Carbide & Carbon Corp.

Butyl Cellosolve
Union Carbide & Carbon Corp.

n-Butyl Ether
Union Carbide & Carbon Corp.

Butyl Formate
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.

n-Butyl Iodide
American Chemical Products Co.

Butyl Lactate
The Commercial Solvents Corp.

Butyl Oleate
The Commercial Solvents Corp.

Butyl Propionate
American Commercial Alcohol Corp.
Franco-American Chemical Works
Hamilton, A. K.
Pennsylvania Alcohol Corp.

Butyl Stearate
American Commercial Alcohol Corp.
The Commercial Solvents Corp.

Butyric Anhydride
Union Carbide & Carbon Corp.

Butyraldehyde
Union Carbide & Carbon Corp.

Butylene
Union Carbide & Carbon Corp.

Cable Dope
Monsanto Chemical Co.

***Cadmium**
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Cadmium Acetate**
Mallinckrodt Chemical Works

***Cadmium Bromide**
The Dow Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas & Co., Inc.

Cadmium Cadalyte
The Grasselli Chemical Co.

***Cadmium Carbonate**
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

***Cadmium Chloride**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Cadmium Colors**
Wishnick-Tumpeer, Inc.

Cadmium-Copper Alloys
The Grasselli Chemical Co.

Cadmium Hydrate
The Grasselli Chemical Co.

Cadmium Iodide
Mallinckrodt Chemical Works

***Cadmium Iodide**
Merck & Co., Inc.
Pfizer, Chas & Co., Inc.

***Cadmium Nitrate**
Mallinckrodt Chemical Works

***Cadmium Oxide**
The Grasselli Chemical Co.

Cadmium Potassium Iodide
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

***Cadmium Salts**
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Cadmium Sulfate**
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

***Cadmium Sulfide**
Wishnick-Tumpeer, Inc.

Cadmium—Zinc Alloys
The Grasselli Chemical Co.

***Caffeine**
Monsanto Chemical Co.
Merck & Co., Inc.
Mallinckrodt Chemical Works
Pfizer, Chas & Co., Inc.

Caffeine Benzoate
Mallinckrodt Chemical Works
Seydel Chemical Co.

Caffeine Calamine
Mallinckrodt Chemical Works

Caffeine Citrated
Mallinckrodt Chemical Works
Monsanto Chemical Co.
Pfizer, Chas. & Co., Inc.

Caffeine Hydrobromide
Mallinckrodt Chemical Works

Caffeine Salicylate
Mallinckrodt Chemical Works

Caffeine Sodio-Benzoate
Mallinckrodt Chemical Works
Seydel Chemical Co.

Caffeine Sodio-Salicylate
Mallinckrodt Chemical Works

***Calcium**
Pfizer, Chas & Co., Inc.

***Calcium Acetate**
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Calcium Acid Phosphate
Mallinckrodt Chemical Works

Calcium Arsenate
The Dow Chemical Co.
Mechling Bros. Chemical Co.

Calcium Benzoate
Heyden Chemical Corp.
Seydel Chemical Co.

***Calcium Bromide**
The Dow Chemical Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Pfizer, Chas & Co., Inc.

***Calcium Carbonate**
Columbia Alkali Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Calcium Caseinate
American Cyanamid & Chemical Corp.

***Calcium Chloride**
Columbia Alkali Co.
The Dow Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Michigan Alkali Co.
Monsanto Chemical Co.
Wishnick-Tumpeer, Inc.

Calcium Citrate
Mallinckrodt Chemical Works

Calcium Cyanide
American Cyanamid & Chemical Corp.
Merck & Co., Inc.

***Calcium Ferrocyanide**
Bower, Henry Chemical Mfg. Co.

Calcium Fluoride
Mallinckrodt Chemical Works

Calcium Gluconate
Mallinckrodt Chemical Works
Pfizer, Chas & Co., Inc.

Calcium Glycerophosphate
Heyden Chemical Corp.
Mallinckrodt Chemical Works

Calcium Guaiacol Sulfonate
Heyden Chemical Corp.

Calcium, High Test
Mathieson Alkali Works, Inc.

***Calcium Hydroxide**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Calcium Hypochlorite
Mathieson Alkali Works, Inc.
Pennsylvania Salt Mfg. Co.

Calcium Hypophosphite
Mallinckrodt Chemical Works

Calcium Iodide
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Calcium Lactate
Mallinckrodt Chemical Works
Merck & Co., Inc.

Calcium Lactophosphate
Mallinckrodt Chemical Works

Calcium Malate, Normal
National Aniline & Chemical Co., Inc.

***Calcium Nitrate**
Mallinckrodt Chemical Works
Pfizer, Chas & Co., Inc.

***Calcium Oxalate**
Mallinckrodt Chemical Works
Victor Chemical Works

***Calcium Oxide**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Calcium Permanganate
Carus Chemical Co.

Calcium Peroxide
Mallinckrodt Chemical Works

Calcium Phosphate Dibasic
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Victor Chemical Works
Warner Chemical Co.

Calcium Phosphate Monobasic
Mallinckrodt Chemical Works
Victor Chemical Works
Warner Chemical Co.

***Calcium Phosphate, Tribasic**
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Victor Chemical Works
Warner Chemical Co.

Calcium Saccharate
Mallinckrodt Chemical Works

Calcium Salicylate
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Calcium Stearate
Mallinckrodt Chemical Works
National Oil Products Co.
Wishnick-Tumpeer, Inc.

***Calcium Sulfate**
American Cyanamid & Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Calcium Sulfide**
Mallinckrodt Chemical Works

***Calcium Sulfite**
Mallinckrodt Chemical Works

***Calcium Sulfo-Carbolate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Calcium Tungicide
Mallinckrodt Chemical Works

Calcium & Sodium Hypophosphite
Mallinckrodt Chemical Works

***Calomel**

Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas & Co., Inc.

Camphor

E. I. du Pont de Nemours & Co.

Camphor, Monobromated

The Dow Chemical Co.
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Carbitol

Union Carbide & Carbon Corp.

Carbitol Acetate

Union Carbide & Carbon Corp.

***Carbon Black**

Binney & Smith Co.
The Commercial Solvents Corp.
Wishnick-Tumpeer, Inc.

***Carbon Bisulfide**

The Dow Chemical Co.
General Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

***Carbon Dioxide**

Mathieson Alkali Works, Inc.

Carbon Dioxide Determination Apparatus

Eimer & Amend

***Carbon Tetrachloride**

The Dow Chemical Co.
General Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

Carboxide

Union Carbide & Carbon Corp.

Carboy Inclinators

Eimer & Amend

***Carmine No. 40**

H. Kohnstamm & Co.

***Case Hardening Compounds**

American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.

***Casein**

American Cyanamid & Chemical Corp.
The Casein Manufacturing Co.
Innis, Speiden & Co.
Merck & Co., Inc.

Casein Spreaders

The Grasselli Chemical Co.
Mechling Bros. Chemical Co.

Casein Waterproof Glue

The Casein Manufacturing Co.

Cast Resinoids

Bakelite Corporation

Catechol

Pennsylvania Coal Products Co.

***Cattle Dip**

General Chemical Co.

***Caustic Ash**

Columbia Alkali Co.
Mathieson Alkali Works
Michigan Alkali Co.
Southern Alkali Corp.

***Caustic Ash Mixtures**

Columbia Alkali Co.
Mathieson Alkali Works
Michigan Alkali Co.
Southern Alkali Corp.

Caustic Potash

Innis, Speiden & Co.
Mallinckrodt Chemical Works
Niagara Alkali Co.
Wishnick-Tumpeer, Inc.

Cellosolve

Union Carbide & Carbon Corp.

Cellosolve Acetate

Union Carbide & Carbon Corp.

***Celluloid Cements**

Monsanto Chemical Co.

Cellulose Acetate

E. I. du Pont de Nemours & Co.

Cellulose Acetate Plastics

E. I. du Pont de Nemours & Co.

Cellulose Acetate Rayon

E. I. du Pont de Nemours & Co.

***Cements**

Bakelite Corporation
Barrett Co.
The Casein Manufacturing Co.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Cerium Oxalate

Mallinckrodt Chemical Works

Certified Biological Stains and Laboratory Reagents

National Aniline & Chemical Co., Inc.

Certified Good Colors

National Aniline & Chemical Co., Inc.

***Chalk**

Binney & Smith Co.
Wishnick-Tumpeer, Inc.

Chalk, Precipitated

Merck & Co., Inc.

Charcoal, Activated

Mallinckrodt Chemical Works

Chloracetyl Chloride

The Dow Chemical Co.

Chloral Butyl-, Hydrate

Mallinckrodt Chemical Works

Chloral Chloroform

Mallinckrodt Chemical Works

***Chloral Hydrate**

Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.

1 : Chlor Alphnaphthol

American Chemical Products Co.

Chloramine

Monsanto Chemical Co.

Chlorasol

Union Carbide & Carbon Corp.

Chlor Benzanthrone

National Aniline & Chemical Co., Inc.

Chlorbutanol, Anhydrous

Seydel Chemical Co.

Chlorbutanol, Hydrate

Seydel Chemical Co.

Chloride of Lime

Innis, Speiden & Co.

Chlorinated Paraffin

American Chemical Products Co.
Hooker Electrochemical Co.
Monsanto Chemical Co.

***Chlorine**

Electro Bleaching Gas Co.
Hooker Electrochemical Co.
Mathieson Alkali Works, Inc.
Monsanto Chemical Co.
Warner Chemical Co.

***Chloroform**

The Dow Chemical Co.
Merck & Co., Inc.
Pfizer, Chas & Co., Inc.

Chlorophyll

Merck & Co., Inc.

6-Chlor Orthoxenol, Purified

The Dow Chemical Co.

6-Chlor Orthoxenol, Technical

The Dow Chemical Co.

Chlor Quinizarine

National Aniline & Chemical Co., Inc.

Chlortoluene

Hooker Electrochemical Co.

Cholesterol

Van Dyk & Co.

***Chrome Alum**

Merck & Co., Inc.
Verona Chemical Co.

Chrome Colors

The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
H. Kohnstamm & Co.
National Aniline & Chemical Co., Inc.

***Chrome Yellows**

H. Kohnstamm & Co.

***Chromium Acetate**

American Cyanamid & Chemical Corp.
John D. Lewis, Inc.
Mallinckrodt Chemical Works

Chromium Chloride

Mallinckrodt Chemical Works

Chromium Fluoride

John D. Lewis, Inc.

Chromium Nitrate

Mallinckrodt Chemical Works

***Chromium Oxide**

Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

***Chromium Sulfate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.

***Chrome Tans, "One Bath"**
The Martin Dennis Co.

Chrysarobin
Mallinckrodt Chemical Works

Cinchona Alkaloids
New York Quinine & Chemical Works

Cinchonidine Alkaloid
Mallinckrodt Chemical Works

Cinchonidine Dihydrobromide
Mallinckrodt Chemical Works

Cinchonidine Hydrochloride
Mallinckrodt Chemical Works

Cinchonidine Salicylate
Mallinckrodt Chemical Works

Cinchonidine Sulfate
Mallinckrodt Chemical Works

***Cinchonidine Sulfate**
Merck & Co., Inc.

Cinchonine, Alkaloid
Mallinckrodt Chemical Works

Cinchonine Bisulfate
Mallinckrodt Chemical Works

Cinchonine Hydrochloride
Mallinckrodt Chemical Works

Cinchonine Salicylate
Mallinckrodt Chemical Works

Cinchonine Sulfate
Mallinckrodt Chemical Works

Cinchophen
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.
Seydel Chemical Co.

Cinchophen Neo-Cinchophen
Mallinckrodt Chemical Works

***Cinnabar**
Mallinckrodt Chemical Works

Citrine Ointment
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Citronellal
E. I. du Pont de Nemours & Co.

Citronellol
Van Dyk & Co.

Citronellol Acetate
Van Dyk & Co.

Citronellol Dextro
Van Dyk & Co.

Citronellol Lalvo
Van Dyk & Co.

Citrus Pectin
California Fruit Growers Exchange

***Clays**
Wishnick-Tumpeer, Inc.

***Cleaner and Cleanser**
Columbia Alkali Co.
Mathieson Alkali Co.
Michigan Alkali Co.
Southern Alkali Co.

Clearo (pickle brine correctives)
Seydel Chemical Co.

Coal Tar Resins
Barrett Co.
Monsanto Chemical Co.

Coal Testing Apparatus
Eimer & Amend

Coated Fabrics
E. I. du Pont de Nemours & Co.

Coated Fabrics Colors
Binney & Smith Co.
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co.

***Cobalt Acetate**
Wishnick-Tumpeer, Inc.

***Cobalt Carbonate**
Mallinckrodt Chemical Works

Cobalt Chloride
Mallinckrodt Chemical Works

***Cobalt Linoleate**
American Cyanamid & Chemical Corp.

***Cobalt Nitrate**
Mallinckrodt Chemical Works

***Cobalt Oxide**
Mallinckrodt Chemical Works

Cobalt Oxide
Wishnick-Tumpeer, Inc.

***Cobalt Resinate**
American Cyanamid & Chemical Corp.

***Cobalt Sulfate**
Mallinckrodt Chemical Works

Cocaine Alkaloid
Mallinckrodt Chemical Works

Cocaine Hydrochloride
Mallinckrodt Chemical Works

Cocaine Nitrate
Mallinckrodt Chemical Works

***Codeine Alkaloid**
Mallinckrodt Chemical Works
New York Quinine & Chemical Works

***Codeine Hydrochloride**
Mallinckrodt Chemical Works

***Codeine Phosphate**
Mallinckrodt Chemical Works
New York Quinine & Chemical Works

***Codeine Sulfate**
Mallinckrodt Chemical Works
New York Quinine & Chemical Works

Colchicine
Mallinckrodt Chemical Works

Colchicine Alkaloid
Seydel Chemical Co.

Cold Top Enamel
Mallinckrodt Chemical Works

Collodine
Wolf, Jacques & Co.

***Collodion**
Hamilton, A. K.
Franco-American Chemical Works
Mallinckrodt Chemical Works
Merck & Co., Inc.

Collodion
U. S. Industrial Alcohol Co.

***Collodion, Photo**
Mallinckrodt Chemical Works

***Collodion, Photo Iodizer**
Mallinckrodt Chemical Works

***Collodion, Photo Stripping**
Mallinckrodt Chemical Works

***Collodion, Photo Thinner**
Mallinckrodt Chemical Works

Colloidal Copper Proteinate
Heyden Chemical Corp.

Colorimeters
Eimer & Amend

Colorless Top Dressing
Innis, Speiden & Co.

Colorless Waterproof Finish
Innis, Speiden & Co.

***Colors, Lake**
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
John D. Lewis, Inc.
National Aniline & Chemical Co.
Zinsser & Co.

Combustion Bulbs
Eimer & Amend

Combustion Tubes
Eimer & Amend

Concentrated Lemon Juices
California Fruit Growers Exchange

Concentrated Orange Juices
California Fruit Growers Exchange

Concrete Colors
Binney & Smith Co.

Condensers
Eimer & Amend

Conductivity Apparatus
Eimer & Amend

***Copper**
Ducktown Chemical & Iron Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

Copper Acetate
Mallinckrodt Chemical Works
Merck & Co., Inc.

Copper, Aluminated
Mallinckrodt Chemical Works

***Copper Arsenate**
Mallinckrodt Chemical Works

***Copper Arsenite**
Mallinckrodt Chemical Works

Copper Bromide
Mallinckrodt Chemical Works

***Copper Carbonate**
Mallinckrodt Chemical Works

***Copper Chloride**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Copper Citrate
Mallinckrodt Chemical Works

***Copper Cyanide**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Copper Gluconate
Pfizer, Chas. & Co., Inc.

***Copper Nitrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Copper Oxide, Black**
Mallinckrodt Chemical Works

***Copper Oxide, Red**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Copper Sulfate**
General Chemical Co.
Irvington Smelting & Refining Co.
Mallinckrodt Chemical Works
Mechling Bros. Chemical Co.
Merck & Co., Inc.

***Copper Sulfide**
Mallinckrodt Chemical Works

Copper Sullfo-carbolate
Mallinckrodt Chemical Works

Copper and Ammonium Chloride
Mallinckrodt Chemical Works

Copper and Potassium Chloride
Mallinckrodt Chemical Works

Copper and Potassium Cyanide
Mallinckrodt Chemical Works

***Copperas**
Merck & Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
Wishnick-Tumpeer, Inc.

Corn Germ Meal
The Commercial Solvents Corp.

Corn Seed Disinfectant
American Cyanamid & Chemical Corp.

***Corrosive Sublimate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

***Cosmetic Colors**
H. Kohnstamm & Co.

Cotton Base Solutions
American Cyanamid & Chemical Corp.
Hamilton, A. K.
Franco-American Chemical Works
Monsanto Chemical Co.
Pennsylvania Alcohol Corp.
U. S. Industrial Alcohol Co.

***Coumarin**
The Dow Chemical Co.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

***Crayons**
Binney & Smith Co.
Monsanto Chemical Co.

***Cream of Tartar**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Stauffer Chemical Co.

Cream Softeners
Wolf, Jacques & Co.

***Creosote**
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Creosote
Monsanto Chemical Co.

Creosote Benzoate
Seydel Chemical Co.

Creosote Beechwood
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Creosote Carbonate**
Heyden Chemical Corp.
Mallinckrodt Chemical Works

***Cresol**
Barrett Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.

Cresol Benzoate
Seydel Chemical Co.

Crotonaldehyde
Union Carbide & Carbon Corp.

Crude Nitrogen Solution
Barrett Co.

Cryolite
Pennsylvania Salt Mfg. Co.

Cryscopes
Eimer & Amend

***Crystal Ammonia**
American Cyanamid & Chemical Corp.

Culture Apparatus
Eimer & Amend

Cumidine
National Aniline & Chemical Co., Inc.

Cupric Acetate
Mallinckrodt Chemical Works

Cupric Bromide
Mallinckrodt Chemical Works

***Cupric Carbonate**
Mallinckrodt Chemical Works

***Cupric Chloride**
Mallinckrodt Chemical Works

***Cupric Nitrate**
Mallinckrodt Chemical Works

***Cupric Oxide**
Mallinckrodt Chemical Works

Curbay Binder
U. S. Industrial Alcohol Co.

***Cutch Extract**
American Dyewood Co.

***Cyanamid**
American Cyanamid & Chemical Corp.

Cyanide-Chloride-Carbonate Mixture
Mallinckrodt Chemical Works
Merck & Co., Inc

Cyanide-Chloride Mixture
Mallinckrodt Chemical Works
Merck & Co., Inc.

Defoamers
National Oil Products Co.

***Depilatories**
Monsanto Chemical Co.

Detergents
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
Columbia Alkali Co.
The Dow Chemical Co.
Mathieson Alkali Co.
Michigan Alkali Co.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.
Sterling Products Co.
Wolf, Jacques & Co.

***Dextrin**
Merck & Co., Inc.
Mallinckrodt Chemical Works

***Dextrin, White, Potatoe**
Mallinckrodt Chemical Works

***Dextrin, Yellow**
Mallinckrodt Chemical Works

***Dextrose**
Mallinckrodt Chemical Works
Seydel Chemical Co.

Diacetine
American Commercial Alcohol Corp.

Dialysers
Eimer & Amend

2-4 Diaminoanisole
Verona Chemical Co.

Diamino diphenyl amine
Monsanto Chemical Co.

p.p.' Diamino Diphenyl Thio Urea Sulfate
American Chemical Products Co.

***Diammonium Phosphate**
Victor Chemical Works

***Diamyl Phthalate**
American Commercial Alcohol Corp.
The Commercial Solvents Corp.

Dianisidine
National Aniline & Chemical Co., Inc.

***Diatamaceous Earth**
Wishnicg-Tumpeer, Inc.

Dibutyl Ether
The Commercial Solvents Corp.

Dibutyl Phthalate
American Commercial Alcohol Corp.
American Cyanamid & Chemical Corp.
The Commercial Solvents Corp.
Hamilton, A. K.
Franco-American Chemical Works
Monsanto Chemical Co.
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Dibutyl Tartrate
American Commercial Alcohol Corp.

***Dicalcium Phosphate**
Victor Chemical Works

Dichloramine
Monsanto Chemical Co.

Dichlorethyl Ether
Union Carbide & Carbon Corp.

Dichlormethane
The Dow Chemical Co.

Dichlorodifluoromethane
E. I. du Pont de Nemours & Co.

Dicyandiamid
American Cyanamid & Chemical Corp.

Diethanolamine
Union Carbide & Carbon Corp.

Diethyl Aniline
National Aniline & Chemical Co., Inc.

Diethyl Carbonate
U. S. Industrial Alcohol Co.

Diethyl Oxalate
Hamilton, A. K.
Franco-American Chemical Works
Pennslyvania Alcohol Corp.

Diethyl Phthalate
American Commercial Alcohol Corp.
Monsanto Chemical Co.
U. S. Industrial Alcohol Co.

Diethyl Sulfate
Union Carbide & Carbon Corp.

Diethylaniline
American Chemical Products Co.
The Dow Chemical Co.

Diethylene Glycol
Union Carbide & Carbon Corp.

Digitalin, German
Mallinckrodt Chemical Works

p'p' Dihydroxy Diphenyl
American Chemical Products Co.

Dimethyl Aniline
National Aniline & Chemical Co., Inc.

Dimethyl Anthranilate
Van Dyk & Co.

Dimethyl Ether
E. I. du Pont de Nemours & Co.

Dimethyl Glyoxime A. P.
Mallinckrodt Chemical Works

Dimethyl Phthalate
American Commercial Alcohol Corp.
The Commercial Solvents Corp.
Monsanto Chemical Co.
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Dimethyl Sulfate
E. I. du Pont de Nemours & Co.

Dimethylaniline
The Calco Chemical Co., Inc.
The Dow Chemical Co.

Dimethylamine
E. I. du Pont de Nemours & Co.

Dimethylglyoxime
American Chemical Products Co.

Dinitraniline
Monsanto Chemical Co.
Verona Chemical Co.

2-4 Dinitroanisole
Verona Chemical Co.

Dinitrobenzene
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.

Dinitrophenol
E. I du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.
Verona Chemical Co.

Dinitrotoluene
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

Dinitrotoluene, Oily
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

Diorthocresol
American Chemical Products Co.

Diorthotolylguanidine
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.

Diorthotolylthiourea
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.

Dioxan
Union Carbide & Carbon Corp.

Diphenol
American Chemical Products Co.

Diphenal Methane
National Aniline & Chemical Co., Inc.

Diphenyl
The Dow Chemical Co.
Monsanto Chemical Co.

Diphenylamine
E. I. du Pont de Nemours & Co.

Diphenylguanidine
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Diphenyl Guanidine Phthalate
Monsanto Chemical Co.

Diphenyloxide
The Dow Chemical Co.

Dipping Lacquers
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Direct Colors
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Direct Dyes
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
John D. Lewis, Inc.
National Aniline & Chemical Co., Inc.

***Disinfectants**
Barrett Co.
Monsanto Chemical Co.
National Oil Products Co.

***Disodium Phosphate**
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
General Chemical Co.
The Grasselli Chemical Co.
Merck & Co., Inc.
Victor Chemical Works
Warner Chemical Co.

Dispersing Agents
Barrett Co.

Distilling Apparatus Alcohol
Eimer & Amend

Distilling Apparatus, Mercury
Eimer & Amend

Distilling Apparatus, Oil
Eimer & Amend

Distilling Apparatus, Vacuum
Eimer & Amend

Distilling Apparatus, Water
Eimer & Amend

Ditolyl Methane
National Aniline & Chemical Co., Inc.

Dopes
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Dover's Powder
Mallinckrodt Chemical Works

Dried Orange Meal
California Fruit Growers Exchange

Driers
Metasap Chemical Co.

Dry Cleaning Solvents
Anderson-Prichard Oil Corp.

Dry Colors
E. I. du Pont de Nemours & Co.

Dry Ice
The Commercial Solvents Corp.
Michigan Alkali Co.
U. S. Industrial Alcohol Co.

Dull Black Finishes
Innis, Speiden & Co.

Dull Mate Finishes
Innis, Speiden & Co.

Dye Discharges
Wolf, Jacques & Co.

Egg Preserver
Mallinckrodt Chemical Works

Elaterium
Mallinckrodt Chemical Works

Electrodes
Eimer & Amend

Electrolytic Apparatus
Eimer & Amend

Emetine
Mallinckrodt Chemical Works

Emulsion Apparatus
Eimer & Amend

Enamels
Bakelite Corporation
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Endiometers
Eimer & Amend

Enzymes
Wolf, Jacques & Co.

Ephedrine, Alkaloid
Mallinckrodt Chemical Works
Seydel Chemical Co.

Ephedrine Benzoate
Seydel Chemical Co.

Ephedrine Hydrochloride
Mallinckrodt Chemical Works
Seydel Chemical Co.

Ephedrine Sulfate
Mallinckrodt Chemical Works
Seydel Chemical Co.

***Epsom Salt**
The Dow Chemical Co.
General Chemical Co.
Mallinckrodt Chemical Works
Mechling Bros. Chemical Co.
Merck & Co., Inc.
Victor Chemical Works
Wishnick-Tumpeer, Inc.

Ergotin-Bonjean
Mallinckrodt Chemical Works

Ergosterol
E. I. du Pont de Nemours & Co.

Eserine, Alkaloid
Mallinckrodt Chemical Works

Eserine, Hydrochloride
Mallinckrodt Chemical Works

Eserine, Salicylate
Mallinckrodt Chemical Works

Eserine, Sulfate
Mallinckrodt Chemical Works

Ethacaine
Seydel Chemical Co.

Ethane
Union Carbide & Carbon Corp.

***Ether**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Ethyl Acetate**
American Commercial Alcohol Corp.
The Commercial Solvents Corp.
E. I. du Pont de Nemours & Co.
Hamilton, A. K.
Franco-American Chemical Works
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Ethyl Acetoacetate
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Ethyl Anthranilate
Van Dyk & Co.

Ethyl Benzoate
Seydel Chemical Co.

Ethyl Benzoyl Benzoate
American Cyanamid & Chemical Corp.

Ethyl Benzyl Aniline
National Aniline & Chemical Co., Inc.

Ethyl Bromide
The Dow Chemical Co.
Mallinckrodt Chemical Works

Ethyl Butyl Acetate
Union Carbide & Chemical Corp.

Ethyl Butyrate
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Ethyl Chlorcanbonate
U. S. Industrial Alcohol Co.

Ethyl Chloride
The Dow Chemical Co.
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Ethyl Citrate
Pfizer, Chas. & Co., Inc.

Ethyl-Ester of Para-Toluol-Sulfonic Acid
Verona Chemical Co.

Ethyl Ether
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Ethyl Formate
The Commercial Solvents Corp.
Hamilton, A. K.
Franco-American Chemical Works
Mallinckrodt Chemical Works

Ethyl Iodide
Mallinckrodt Chemical Works

Ethyl Iodine
American Chemical Products Co.

Ethyl Lactate
American Cyanamid & Chemical Corp.
U. S. Industrial Alcohol Corp.

Ethyl Monobromacetate
The Dow Chemical Co.

Ethyl Monochloracetate
The Dow Chemical Co.

Ethyl Nitrate
Hamilton, A. K.
Franco-American Chemical Works
Mallinckrodt Chemical Works

Ethyl Oxalate
U. S. Industrial Alcohol Co.

Ethyl Propionate
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Ethylamine
American Chemical Products Co.

Ethylene
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Ethylene Bromide
Mallinckrodt Chemical Works

Ethylene Chlorbromide
The Dow Chemical Co.

Ethylene Chlorhydrin
Union Carbide & Carbon Corp.

Ethylene Diamine
Union Carbide & Carbon Corp.

Ethylene Dibromide
The Dow Chemical Co.

Ethylene Dichloride
The Dow Chemical Co.
Union Carbide & Carbon Corp.

Ethylene Glycol
Union Carbide & Carbon Corp.

Ethylene Glycol Acetate
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Ethylene Oxide
Union Carbide & Carbon Corp.

Ethylparatoluenesulfonamid
Monsanto Chemical Co.

Ethyltoluenesulfonamid
Monsanto Chemical Co.

Eucalyptol
Mallinckrodt Chemical Works

Expansion Test Apparatus
Eimer & Amend

Explosion Test Apparatus
Eimer & Amend

Explosives
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.

Extraction Apparatus
Eimer & Amend

Extreme Pressure Lubricant Bases
American Chemical Products Co.

***Fat Liquors, Tanners**
The Martin Dennis Co.

Fatty Alcohols
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co.

Fermentation Tubes
Eimer & Amend

Ferric Ammonium Oxalate
Mallinckrodt Chemical Works

Ferric Ammonium Sulfate
Mallinckrodt Chemical Works

***Ferric Chloride**
The Dow Chemical Co.
Hooker Electrochemical Co.
Mallinckrodt Chemical Works
Pennsylvania Salt Mfg. Co.

Ferric Chloride Sulphate
Sterling Products Co.

***Ferric Nitrate**
Mallinckrodt Chemical Works

***Ferric Sulfate**
Mallinckrodt Chemical Works
Monsanto Chemical Co.

***Ferrocyanide Blues**
H. Kohnstamm & Co.

Ferro Grade Manganese Ore
Freeport Sulphur Co.

Ferrophosphorus
Monsanto Chemical Co.
Victor Chemical Works

Ferrous Ammonium Sulfate
Mallinckrodt Chemical Works

***Ferrous Chloride**
The Dow Chemical Co.
Hooker Electrochemical Co.
Mallinckrodt Chemical Works

Fertilizer Materials
American Cyanamid & Chemical Corp.
Barrett Co.
E. I. du Pont de Nemours & Co.

Fertilizer Samples
Eimer & Amend

***Fertilizers**
American Cyanamid & Chemical Corp.
Barrett Co.
General Chemical Co.
The Grasselli Chemical Co.

***Fillers, Sole Leather**
The Martin Dennis Co.

***Film**
E. I. du Pont de Nemours & Co.

Filtering Apparatus
Eimer & Amend

Filtering Pumps
Eimer & Amend

***Fire Extinguisher Fluid**
Warner Chemical Co.

Fireproofing Compounds
National Oil Products Co.
Victor Chemical Works

Fire Retardants
E. I. du Pont de Nemours & Co.

Flash Point Testers
Eimer & Amend

Flatting Agents
Metasap Chemical Co.

***Flavoring Extracts**
H. Kohnstamm & Co.
Van Dyk & Co.

Flotation Reagents
American Cyanamid & Chemical Corp.
Barrett Co.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Flour Improvers
Innis, Speiden & Co.
Pennsylvania Salt Mfg. Co.

Flour Testing Apparatus
Eimer & Amend

***Food Colors**
H. Kohnstamm & Co.

Food Preservatives
Heyden Chemical Corp.

***Formaldehyde**
E. I. du Pont de Nemours & Co.
Gray, William S. & Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Fowler's Solution
Pfizer, Chas. & Co., Inc.

Freezing Point Apparatus
Eimer & Amend

Fruit Cleaning Materials
American Cyanamid & Chemical Corp.

Fungicides
The Dow Chemical Co.
E. I. du Pont de Nemours & Co.
General Chemical Co.
Mechling Bros. Chemical Co.
Merck & Co., Inc.

Fur Dyes
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
John D. Lewis, Inc.
National Aniline & Chemical Co., Inc.

Furfuraldoxime
American Chemical Products Co.

Furoyl Chloride
Hooker Electrochemical Co.

***Fusel Oil Refined**
American Commercial Alcohol Corp.
The Commercial Solvents Corp.
Mallinckrodt Chemical Works
U. S. Industrial Alcohol Co.

Fustic Extract
American Dyewood Co.

G. Salt
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

***Gambier Extract**
American Dyewood Co.

Gas Analysis Apparatus
Eimer & Amend

Gas Generators
Eimer & Amend

Gas Purifier
Stauffer Chemical Co.

Gasoline Soluble Colors
E. I. du Pont de Nemours & Co.

Gentian Violet Med. Churchman
National Aniline & Chemical Co., Inc.

Geraniol
Van Dyk & Co.

Geramyl Acetate
Van Dyk & Co.

Geramyl Butyrate
Van Dyk & Co.

Geramyl Formate
Van Dyk & Co.

***Gilsonite**
Wishnick-Tumpeer, Inc.

Glass Laboratory Apparatus
Eimer & Amend

***Glauber's Salt**
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Merck & Co., Inc.
Monsanto Chemical Co.
Stauffer Chemical Co.
Victor Chemical Works

Glucono Delta Lactone
Pfizer, Chas & Co., Inc.

***Glues**
The Casein Manufacturing Co.

***Glycerin**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Glycerophophates
Heyden Chemical Corp.
Monsanto Chemical Co.

Glycocoll
Mallinckrodt Chemical Works

***Gold**
Irvington Smelting & Refining Co.

***Gold Chloride**
Mallinckrodt Chemical Woorks

***Gold Chloride Acid Yellow**
Merck & Co., Inc.

Gold, Mono-Bromide
Mallinckrodt Chemical Works

Gold, Tri-Bromide
Mallinckrodt Chemical Works

Gold and Sodium Chloride
Mallinckrodt Chemical Works

Gold and Tinning Flux
Warner Chemical Co.

Gravitometers
Eimer & Amend

Grease Bases
Metasap Chemical Co.

Grinders
Eimer & Amend

Guaiacol
Mallinckrodt Chemical Works
Merck & Co., Inc.

Guaiacol Benzoate
Seydel Chemical Co.

***Guaiacol Carbonate**
Heyden Chemical Corp.
Mallinckrodt Chemical Works

Guaiacol Crystals
Heyden Chemical Corp.

Guaiacol Liquid
Heyden Chemical Corp.

Guaiacol Sulfonate, Potassium
Mallinckrodt Chemical Works

Gum, Arabic
Innis, Speiden & Co.
Wolf, Jacques & Co.

Gum, Ester
American Cyanamid & Chemical Corp.
John D. Lewis, Inc.
Wolf, Jacques & Co.

Gum, Irish Moss
Wolf, Jacques & Co.

Gum, Karaya
Innis, Speiden & Co.
Wolf, Jacques & Co.

Gum, Label
Wolf, Jacques & Co.

Gum, Lupogum
Wolf, Jacques & Co.

Gum, Tragacanth
Innis, Speiden & Co.
Wolf, Jacques & Co.

Gum Inhibitors for Gasoline
E. I. du Pont de Nemours & Co.

Gum Solutions
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

***Hematine Extract**
American Dyewood Co.

Hexachlorbenzene
Hooker Electrochemical Co.

Hexachlorethane
The Dow Chemical Co.

***Hexamethylenamine**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

***Hexamethylenetetramine**
Heyden Chemical Corp.

n-Hexanol
Union Carbide & Carbon Corp.

Hexone
Union Carbide & Carbon Corp.

Hi-Flash Naphtha
Barrett Co.

Homatropine Alkaloid
Mallinckrodt Chemical Works

Homatropine Hydrobromide
Mallinckrodt Chemical Works

Homatropine Hydrochloride
Mallinckrodt Chemical Works

Homatropine Sulfate
Mallinckrodt Chemical Works

Hydrastine Alkaloid
Mallinckrodt Chemical Works

Hydrastine, Hydrochloride
Mallinckrodt Chemical Works

Hydrastine, Sulfate
Mallinckrodt Chemical Works

Hydrated Lime
Innis, Speiden & Co.

Hydrazine Dihydrochloride
American Chemical Products Co.

Hydrazine Hydrate
American Chemical Products Co.

Hydrazine Sulfate
American Chemical Products Co.

Hydrocarbons
Wishnick-Tumpeer, Inc.

***Hydrogen**
Hooker Electrochemical Co.

Hydrogen Ion Buffer Solutions
Eimer & Amend

Hydrogen Ion Indicator
Eimer & Amend

***Hydrogen Peroxide**
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Warner Chemical Co.

Hydrometers, A. P. I.
Eimer & Amend

Hydrometers, Beaume
Eimer & Amend

Hydrometers, Brix
Eimer & Amend

Hydrometers, Specific Gravity
Eimer & Amend

Hydrometers, Twaddle
Eimer & Amend

Hydroquinone
Carus Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
National Aniline & Chemical Co., Inc.
Verona Chemical Co.

Hydroxylamine Benzoate
American Chemical Products Co.

Hydroxylamine Hydrochloride
American Chemical Products Co.

Hydroxylamine Sulfate
American Chemical Products Co.

Hyoscine, Hydrobromide
Mallinckrodt Chemical Works

Hyoscine, Hydrochloride
Mallinckrodt Chemical Works

Hyoscyamine, Alkaloid
Mallinckrodt Chemical Works

Hyoscyamine, Hydrobromide U. S. P.
Mallinckrodt Chemical Works

Hyoscyamine, Hydrochloride
Mallinckrodt Chemical Works

Hyoscyamine Sulfate
Mallinckrodt Chemical Works

***Hypernic Extract**
American Dyewood Co.

Hypochlorite
Mathieson Alkali Works, Inc.
Pennsylvania Salt Mfg. Co.

Ichthymall
Mallinckrodt Chemical Works

Indian Reds
Binney & Smith Co.

Indium
The Grasselli Chemical Co.

Ink Colors
Binney & Smith Co.
The Calco Chemical Co.
John D. Lewis, Inc.
National Aniline & Chemical Co.

Insecticides
American Cyanamid & Chemical Corp.
Barrett Co.
The Dow Chemical Co.
E. I. du Pont de Nemours & Co.
General Chemical Co.
The Grasselli Chemical Co.
Innis, Speiden & Co.
Mechling Bros. Chemical Co.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.

Insecticide Sprays
Innis, Speiden & Co.

Insecticide Spreading Powders
Monsanto Chemical Co.

***Intermediates**
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Corp.
Verona Chemical Co.

***Iodine**
The Dow Chemical Co.
Mallinckrodt Chemical Works
Merck & Co. Inc.
Pfizer, Chas & Co., Inc.

Iodine Tincture
Mallinckrodt Chemical Works

Iodine, Resublimed
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

***Iodoform**
Mallinckrodt Chemical Works
New York Quinine & Chemical Works
Pfizer, Chas & Co., Inc.

***Iron**
Merck & Co., Inc.

Iron Acetate Scales
Mallinckrodt Chemical Works

Iron Albuminate Scales
Mallinckrodt Chemical Works

Iron Arsenated
Mallinckrodt Chemical Works

Iron Arsenite
Mallinckrodt Chemical Works

Iron Benzoate
Seydel Chemical Co.

Iron Bromide
Mallinckrodt Chemical Works

Iron Carbonate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Iron Chloride
Innis, Speiden & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Pfizer, Chas. & Co., Inc.

Iron Chloride Citro
Mallinckrodt Chemical Works

Iron Chloride Solution
Pfizer, Chas. & Co., Inc.

***Iron Citrate**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Iron-Coppers Nitrate
General Chemical Co.

***Iron Ferrocyanide**
Mallinckrodt Chemical Works

***Iron Filings**
Mallinckrodt Chemical Works

Iron Gluconate
Pfizer, Chas. & Co., Inc.

Iron Glycerophosphate
Heyden Chemical Corp.
Mallinckrodt Chemical Works

***Iron Hydroxide**
Mallinckrodt Chemical Works

Iron Hypophosphite
Mallinckrodt Chemical Works

***Iron Iodide**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Iron Lactate
Mallinckrodt Chemical Works

Iron Liquor, Black
American Cyanamid & Chemical Corp.

***Iron Nitrate**
Mallinckrodt Chemical Works
Monsanto Chemical Co.
Pfizer, Chas. & Co., Inc.

Iron Oxalate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Iron Oxide
Mallinckrodt Chemical Works
Merck & Co., Inc.

Iron Peptonized
Mallinckrodt Chemical Works

***Iron Phosphate**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.
Pfizer, Chas. & Co., Inc.

***Iron Pyrites**
Mallinckrodt Chemical Works
The Grasselli Chemical Co.

***Iron Pyrophosphate**
Mallinckrodt Chemical Works

***Iron Sinter**
Ducktown Chemical & Iron Co.

***Iron Subsulfate**
Mallinckrodt Chemical Works

Iron Succinate
Mallinckrodt Chemical Works

Iron Tartrate
Mallinckrodt Chemical Works

Iron, True Nitrate
General Chemical Co.

Iron Valerate
Mallinckrodt Chemical Works

***Iron and Ammonium Citrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

***Iron and Ammonium Oxalate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

***Iron and Ammonium Sulfate**
Mallinckrodt Chemical Works

***Iron and Ammonium Tartrate**
Pfizer, Chas. & Co., Inc.

Iron and Manganese Citrate
Mallinckrodt Chemical Works

Iron and Manganese Peptonized
Mallinckrodt Chemical Works

***Iron and Potassium Oxalate**
Mallinckrodt Chemical Works

***Iron and Potassium Tartrate**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Iron and Quinine Citrate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Iron Quinine and Strychnine Citrate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

***Iron and Sodium Oxalate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Iron and Strychnine Citrate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Isatin
National Aniline & Chemical Co., Inc.
Verona Chemical Co.

Isobutane
Union Carbide & Carbon Corp.

Isobutyl Acetate
E. I. du Pont de Nemours & Co.

Iso-Butyl Benzoate
Seydel Chemical Co.

Isopropanol
Union Carbide & Carbon Corp.

Isopropyl Acetate
Union Carbide & Carbon Corp.

Iso Propyl Chloride
Hooker Electrochemical Co.

Isopropyl Ether
Union Carbide & Carbon Corp.

***Kalsomine and Cold Water Paints**
Stauffer Chemical Co.

***Kaolin**
Merck & Co., Inc.

Laboratory Apparatus
Eimer & Amend

Lacquer Diluents
Anderson-Prichard Oil Corp.

Lacquer Colors
Binney Smith Co.
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co.

Lacquers
Bakelite Corporation
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

***Lactose**
Mallinckrodt Chemical Works

Laminated Material
Bakelite Corporation

Laminating Varnishes
The Commercial Solvents Corp.

***Lake Colors**
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
H. Kohnstamm & C.o
National Aniline & Chemical Co., Inc.

***Laundry Blues**
H. Kohnstamm & Co.

***Laundry Supplies**
H. Kohnstamm & Co.

***Lead**
Mallinckrodt Chemical Works

***Lead Acetate**
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

***Lead Arsenate**
The Dow Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Mechling Bros. Chemical Co.

Lead Bromide
Mallinckrodt Chemical Works

***Lead Carbonate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Lead Chloride**
Mallinckrodt Chemical Works

***Lead Chromate**
Mallinckrodt Chemical Works

Lead Iodide
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Lead Lactate
Mallinckrodt Chemical Works

***Lead Linoleates**
American Cyanamid & Chemical Corp.
Mallinckrodt Chemical Works

Lead Molybdate
American Chemical Products Co.

***Lead Nitrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Lead Oleate
Wishnick-Tumpeer, Inc.

***Lead Oxide**
Mallinckrodt Chemical Works

Lead Peroxide
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

Lead Phosphate
Mallinckrodt Chemical Works

***Lead Resinate**
American Cyanamid & Chemical Corp.

***Lead Subacetate**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

***Lead Sulfate**
Mallinckrodt Chemical Works

***Lead Sulfide**
Mallinckrodt Chemical Works

***Lead Sulfocyanate**
Merck & Co., Inc.

Lead Tetraethyl
E. I. du Pont de Nemours & Co.

Lead Tungstate
American Chemical Products Co.

Leather and Top Dressings
E. I. du Pont de Nemours & Co.
Innis, Speiden & Co.

Lecture Apparatus
Eimer & Amend

Lemon Juices
California Fruit Growers Exchange

Light Soda Fluoride
Sterling Products Co.

Light Weight Concrete Aggregate
Victor Chemical Works

***Lime**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Lime, Iodized Dark
Mallinckrodt Chemical Works

***Lime Sulfur**
The Dow Chemical Co.

***Limestone**
Gray, William S. & Co.

Linalove
Van Dyk & Co.

Linalyl Acetate
Van Dyk & Co.

Linoleum Colors
Binney & Smith Co.
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co.

Liquid Carbon Dioxide
The Commercial Solvents Corp.
U. S. Industrial Alcohol Corp.

***Liquid Roof Cement**
Barrett Co.

Liquid Smoke
Sterling Products Co.

***Litharge**
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

Lithium Acetate
Mallinckrodt Chemical Works

Lithium Benzoate
Mallinckrodt Chemical Works
Seydel Chemical Co.

Lithium Benzo-Salicylate
Mallinckrodt Chemical Works

Lithium Bitartrate
Mallinckrodt Chemical Works

***Lithium Bromide**
The Dow Chemical Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works

Lithium Carbonate
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Lithium Chloride**
Merck & Co., Inc.
Mallinckrodt Chemical Works

***Lithium Citrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Lithium Fluoride
Mallinckrodt Chemical Works
Sterling Products Co.

Lithium Iodide
Mallinckrodt Chemical Works

Lithium Nitrate
Mallinckrodt Chemical Works

Lithium Phosphate
Mallinckrodt Chemical Works

***Lithium Salicylate**
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Lithium Sulfate
Mallinckrodt Chemical Works

Lithium Tartrato
Mallinckrodt Chemical Works

***Lithopone**
E. I. du Pont de Nemours & Co.
Wishnick-Tumpeer, Inc.

***Liver of Sulfur**
Merck & Co., Inc.

Lobeline Sulfate
Mallinckrodt Chemical Works

***Logwood Extract**
American Dyewood Co.

***Lunar Caustic**
Mallinckrodt Chemical Works

***Lye**
Columbia Alkali Co.
Mathieson Alkali Co.
Michigan Alkali Co.
Pennsylvania Salt Mfg. Co.
Southern Alkali Co.

***Magnesia**
Wishnick-Tumpeer, Inc.

***Magnesia Insulating Materials**
The Commercial Solvents Corp.

***Magnesite, Calcined**
Warner Chemical Co.

***Magnesite, Crude**
Warner Chemical Co.

Magnesium
The Dow Chemical Co.
Mallinckrodt Chemical Works

Magnesium Acetate
Mallinckrodt Chemical Works

Magnesium Arsenate
The Dow Chemical Co.

Magnesium Arsenate Dust Mixture
The Dow Chemical Co.

Magnesium Benzoate
Seydel Chemical Co.

***Magnesium Bromide**
The Dow Chemical Co.
Mallinckrodt Chemical Works

***Magnesium Carbonate**
Merck & Co., Inc.
Gray, William S. & Co.
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

***Magnesium Chloride**
The Dow Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

Magnesium Citrate
Mallinckrodt Chemical Works

Magnesium Fluosilicate
E. I. du Pont de Nemours & Co.

Magnesium Gluconate
Pfizer, Chas. & Co., Inc.

Magnesium Glycerophosphate
Heyden Chemical Corp.
Mallinckrodt Chemical Works

Magnesium Hydroxide Medicinal
Mallinckrodt Chemical Works

Magnesium Hypophosphate
Mallinckrodt Chemical Works

Magnesium Nitrate
Mallinckrodt Chemical Works

Magnesium Oleate
Wishnick-Tumpeer, Inc.

***Magnesium Oxide**
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

Magnesium Permanganate
Carus Chemical Co.

Magnesium Peroxide
Mallinckrodt Chemical Works

Magnesium Phosphate
Mallinckrodt Chemical Works
Victor Chemical Works

Magnesium Salicylate
The Dow Chemical Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Magnesium Silicate
Mallinckrodt Chemical Works

Magnesium Silicofluoride
Sterling Products Co.

Magnesium Stearate
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

Magnesium Sulfite
Mallinckrodt Chemical Works

Maleic Anhydride
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.

***Manganese**
Wishnick-Tumpeer, Inc.

Manganese Acetate
Mallinckrodt Chemical Works

Manganese Arsenate
E. I. du Pont de Nemours & Co.
The Grasselli Chemical Co.

Manganese Bromide
Mallinckrodt Chemical Works

Manganese Butyrate
Mallinckrodt Chemical Works

Manganese Carbonate
Mallinckrodt Chemical Works

Manganese Chloride
Mallinckrodt Chemical Works

Manganese Citrate
Mallinckrodt Chemical Works

***Manganese Dioxide**
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

Manganese Glycerophosphate
Heyden Chemical Corp.
Mallinckrodt Chemical Works

Manganese Hypophosphite
Mallinckrodt Chemical Works

Manganese Iodide
Mallinckrodt Chemical Works
Pfizer, Chas & Co., Inc.

Manganese Linoleate
American Cyanamid & Chemical Corp.
Mallinckrodt Chemical Works

Manganese Nitrate
Mallinckrodt Chemical Works

Manganese Peptonized
Mallinckrodt Chemical Works

Manganese Resinate
American Cyanamid & Chemical Corp.

Manganese Sulfate
Mallinckrodt Chemical Works
Merck & Co., Inc.
Carus Chemical Co.

Manganese Sulfate Fertilizer Grade
Carus Chemical Co.

Manganese Sulfate Hydrous
Carus Chemical Co.

Manure Salts 25% K20
United States Potash Co.

Manure Salts 30% K20
United States Potash Co.

Marble Chips
Mallinckrodt Chemical Works

***Marble Flour**
Gray, William S. & Co.

***Marking and Checking Crayons**
Binney & Smith Co.

Mass of Mercury
Mallinckrodt Chemical Works

Melting Point Apparatus
Eimer & Amend

Menthol
Mallinckrodt Chemical Works
Merck & Co., Inc.
New York Quinine & Chemical Works

Mercaptan
Mallinckrodt Chemical Works

Mercodel
Seydel Chemical Co.

Mercurial Ointment
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Mercuric Acetate
Mallinckrodt Chemical Works

Mercuric Bromide
Mallinckrodt Chemical Works

***Mercuric Chloride**
Mallinckrodt Chemical Works

Mercuric Cyanide
Mallinckrodt Chemical Works

Mercuric Iodide
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

***Mercuric Nitrate**
Mallinckrodt Chemical Works

***Mercuric Oxide**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Mercuric Sulfate
Mallinckrodt Chemical Works

***Mercurous Chloride**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Mercurous Iodide Yellow
Pfizer, Chas. & Co., Inc.

Mercurous Nitrate
Mallinckrodt Chemical Works

Mercurous Sulfate
Mallinckrodt Chemical Works

***Mercury**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Mercury Acetate
Mallinckrodt Chemical Works

Mercury Ammoniated
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Mercury Benzoate
Seydel Chemical Co.

***Mercury Bisulfate**
Mallinckrodt Chemical Works
Pfizer, Chas & Co., Inc.

Mercury Bromide
Mallinckrodt Chemical Works

***Mercury Chloride**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Mercury Cyanide
Mallinckrodt Chemical Works

Mercury Iodide
Mallinckrodt Chemical Works

Mercury Nitrate
American Cyanamid & Chemical Corp.
Mallinckrodt Chemical Works

Mercury Oleate
Mallinckrodt Chemical Works

***Mercury Oxide**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Mercury Salicylate
Mallinckrodt Chemical Works

Mercury Subsulfate
Mallinckrodt Chemical Works

Mercury Sulfate
Mallinckrodt Chemical Works

Mercury Sulfide
Mallinckrodt Chemical Works

***Mercury Sulfocyanate**
Merck & Co., Inc.

Mercury and Potassium Iodide
Mallinckrodt Chemical Works

Mercury with Chalk
Pfizer, Chas. & Co., Inc.

Methan Base
The Calco Chemical Co.

Methane
Union Carbide & Carbon Corp.

***Methanol**
The Commercial Solvents Corp.
E. I. du Pont de Nemours & Co.
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Meta Chloraniline
Monsanto Chemical Co.

Meta Cresol
Barrett Co.
Monsanto Chemical Co.

Meta-Methyl Benzaldehyde
Heyden Chemical Corp.

Meta Nitraniline
The Calco Chemical Co.
Verona Chemical Co.

Meta Nitrobenzoyl Chloride
Hooker Electrochemical Co.

Meta Nitroparacresol
Verona Chemical Co.

Meta Nitroparatoluidine
The Calco Chemical Co.

Meta Nitro Para Toluidine
National Aniline & Chemical Co., Inc.
Pennsylvania Coal Products Co.

Meta-Para Cresol
Barrett Co.
Monsanto Chemical Co.

Meta Toluenediamine
The Calco Chemical Co.

***Metallic Soaps**
American Cyanamid & Chemical Corp.
Metasap Chemical Co.

***Methyl Acetate**
Gray, William S. & Co.
Union Carbide & Carbon Corp.

Methyl Acetoacetate
Union Carbide & Carbon Corp.

***Methyl Acetone**
Union Carbide & Carbon Corp.
U. S. Industrial Alcohol Co.

Methyl Acetophenone
Van Dyk & Co.

Methyl Amyl Acetate
Union Carbide & Carbon Corp.

Methyl Amy Ketone
Union Carbide & Carbon Corp.

Methyl Anthranilate
The Dow Chemical Co.
Van Dyk & Co.

Methyl Benzoate
Seydel Chemical Co.

Methyl Bromide
The Dow Chemical Co.

Methyl Carbitol
Union Carbide & Carbon Corp.

Methyl Cellosolve
Union Carbide & Carbon Corp.

Methyl Cellosolve Acetate
Union Carbide & Carbon Corp.

Methyl Chloride
E. I. du Pont de Nemours & Co.

Methyl Ethyl Ketone
American Commercial Alcohol Corp.
Gray, William S. & Co.

Methyl Formate
The Commercial Solvents Corp.
E. I. du Pont de Nemours & Co.
Victor Chemical Works

Methyl Hexyl Carbinol
American Chemical Products Co.

Methyl Hexyl Ketone
American Chemical Products Co.

Methyl Iodide
American Chemical Products Co.
Mallinckrodt Chemical Works

Methyl Para-Hydroxy Benzoate
Heyden Chemical Corp.

Methyl Monochloracetate
The Dow Chemical Co.

Methyl Orange
Mallinckrodt Chemical Works

Methyl Red
Mallinckrodt Chemical Works

***Methyl Salicylate**
The Dow Chemical Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.

Methyl Violet
National Aniline & Chemical Co., Inc.

Methyl Violet Ketone (Methyl Ionone)
Van Dyk & Co.

Methylamine
American Chemical Products Co.
The Commercial Solvents Corp.

Methylamine Hydrochoride
American Chemical Products Co.

***Methylene Blue**
Mallinckrodt Chemical Works
National Aniline & Chemical Co., Inc.

Methylene Chloride
The Dow Chemical Co.
E. I. du Pont de Nemours & Co.

***Mica**
Wishnick-Tumpeer, Inc.

Micro Chemical Apparatus
Eimer & Amend

***Milk Sugar**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Milk Testing Apparatus
Eimer & Amend

***Mineral Colors**
Wishnick-Tumpeer, Inc.

***Mineral Rubber**
Binney & Smith Co.
Wishnick-Tumpeer, Inc.

Mixed Mononitroluene
The Calco Chemical Co.

Mixed Toluidine
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

Mobenate Elixer
Seydel Chemical Co.

Mobenate, Powder
Seydel Chemical Co.

Mobenate, Tablets
Seydel Chemical Co.

Modeling Material
Binney & Smith Co.

Moisture Testing Apparatus
Eimer & Amend

Mold Paste
Monsanto Chemical Co.

Molding Materials
American Cyanamid & Chemical Corp.
Bakelite Corp.
The Commercial Solvents Corp.

Molding Resins
Bakelite Corp.
The Commercial Solvents Corp.

Molecular Weight Apparatus
Eimer & Amend

***Monoammonium Phosphate**
Victor Chemical Works

Monobrombenzene
The Dow Chemical Co.

***Monochlorbenzene**
The Dow Chemical Co.
E. I. du Pont de Nemours & Co.
Hooker Electrochemical Co.
Monsanto Chemical Co.

Monoethylaniline
E. I. du Pont de Nemours & Co.

Monoethanolamine
Union Carbide & Carbon Corp.

Monoethyl Ether
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Monofluorotrichloromethane
E. I. du Pont de Nemours & Co.

***Monosodium Phosphate**
General Chemical Co.
Victor Chemical Works

Mordant and Chrome Dyes
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
John D. Lewis, Inc.
National Aniline & Chemical Co., Inc.

Mordant Strikers
Innis, Speiden & Co.

***Morphine Acetate**
Mallinckrodt Chemical Works

***Morphine Alkaloid**
Mallinckrodt Chemical Works
New York Quinine & Chemical Works

***Morphine Hydrobromide**
Mallinckrodt Chemical Works

***Morphine Hydrochloride**
Mallinckrodt Chemical Works

Morphine Ethyl-Hydrochloride
Mallinckrodt Chemical Works

***Morphine Sulfate**
Mallinckrodt Chemical Works
New York Quinine & Chemical Works

***Moth Proofing Compounds**
American Cyanamid & Chemical Corp.
Barrett Co.
Merck & Co., Inc.
Niagara Alkali Co.

Muriate of Potash 50% K20
United States Potash Co.

Muriate of Potash High Grade
United States Potash Co.

Naphthalene
Barrett Co.
The Grasselli Chemical Co.

Napthol Benzoate
Seydel Chemical Co.

Naphthols, Color Salts and Bases, Dyes
National Aniline & Chemical Co., Inc.

Naphthylamine
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.

Needle Antimony
Merck & Co., Inc.

Neoarsphenamine
Mallinckrodt Chemical Works

Neo-Cinchophen
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.
Seydel Chemical Co.

Neo Tetradol Powder-Chocolated
National Aniline & Chemical Co., Inc.

Neutral Acriflavine
National Aniline & Chemical Co., Inc.

***Nickel**
Mallinckrodt Chemical Works

Nickel Acetate
Mallinckrodt Chemical Works

Nickel Bromide
Mallinckrodt Chemical Works

Nickel Carbonate
Mallinckrodt Chemical Works

***Nickel Chloride**
Mallinckrodt Chemical Works

Nickel Dibenzyl Dioxime
American Chemical Products Co.

Nickel Dimethylglyoxime
American Chemical Products Co.

Nickel Formate
Victor Chemical Works

Nickel Nitrate
Mallinckrodt Chemical Works

Nickel Oxide Black
Mallinckrodt Chemical Works

***Nickel Sulfate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Nickel and Ammonium Sulfate
Mallinckrodt Chemical Works
Merck & Co., Inc.

Nigrosines
The Calco Chemical Co.

***Nitre Cake**
American Cyanamid & Chemical Corp.
The Calco Chemical Co.
General Chemical Co.
The Grasselli Chemical Co.
Monsanto Chemical Co.

Nitro-Amino Phenol (4: 2: 1)
National Aniline & Chemical Co., Inc.

***Nitrobenzene**
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
Merck & Co., Inc.
National Aniline & Chemical Co., Inc.

Nitrocellulose
American Cyanamid & Chemical Corp.
General Chemical Co.
Monsanto Chemical Co.
Stauffer Chemical Co.

Nitrogen Determination Apparatus
Eimer & Amend

Nitrogen Products
Barrett Co.

Nitroso Betanaphthol
American Chemical Products Co.

Nitroso Phenol (Para)
National Aniline & Chemical Co., Inc.

***Ochres**
Wishnick-Tumpeer, Inc.

Octyl Acetate
American Chemical Products Co.
Union Carbide & Carbon Corp.

Octyl Aldehyde
American Chemical Products Co.
Union Carbide & Carbon Corp.

Octyl Derivatives
American Chemical Products Co.

Oil, Animal
The Martin Dennis Co.

Oil, Anthracene
Monsanto Chemical Co.

Oils, Base
Wolf, Jacques & Co.

Oil, Bleaching
Wolf, Jacques & Co.

Oils, Boil-off
Wolf, Jacques & Co.

***Oil, Castor**
Wishnick-Tumpeer, Inc.
Wolf, Jacques & Co.

Oil Colors
The Calco Chemical Co.

Oil Corn
The Commercial Solvents Corp.

Oil, Dip
Barrett Co.

Oils, Emulsifying
National Oil Products Co.
Wolf, Jacques & Co.

Oil, Hydrocarbon
Barrett Co.

***Oils, Leather**
American Cyanamid & Chemical Corp.
National Oil Products Co.
Wolf, Jacques & Co.

Oil Lemon
California Fruit Growers Exchange

Oils, Metal Working
National Oil Products Co.

Oil, Napping
Wolf, Jacques & Co.

Oils, Neutral
Barrett Co.

Oil Orange
California Fruit Growers Exchange

Oil Palm
Wishnick-Tumpeer, Inc.

Oil, Para
Wolf, Jacques & Co.

***Oil Rosin**
Wishnick-Tumpeer, Inc.

Oil Rayon
American Cyanamid & Chemical Corp.
National Oil Products Co.
Wolf, Jacques & Co.

Oil, Silk Soaking
Wolf, Jacques & Co.

Oil, Soluble Pine
Wolf, Jacques & Co.

***Oils Sulfonated**
American Cyanamid & Chemical Corp.
The Martin Dennis Co.
National Oil Products Co.
Wolf, Jacques & Co.

Oils, Castor, Sulphonated
Wolf, Jacques & Co.

Oil Sulphonated Cocoanut
Wolf, Jacques & Co.

***Oils, Tanning**
American Cyanamid & Chemical Corp.
The Martin Dennis Co.
National Oil Products Co.

Oil Tar Acid
Barrett Co.

Oil Testers
Eimer & Amend

Oils, Textile
American Cyanamid & Chemical Corp.
National Oil Products Co.
Wolf, Jacques & Co.

Oil, Throwing
Wolf, Jacques & Co.

Oils, Water Soluble
National Oil Products Co.

Ointment of Mercuric Nitrate
Pfizer, Chas. & Co., Inc.

***Oleum**
The Calco Chemical Co.
Ducktown Chemical & Iron Co.
General Chemical Co.
The Grasselli Chemical Co.
Monsanto Chemical Co.

Opacimeters
Eimer & Amend

Opium Gum
Mallinckrodt Chemical Works
New York Quinine & Chemical Works

Orange Juices
California Fruit Growers Exchange

Orthoamidophenol
Verona Chemical Co.

Orthoaminometacresol
Verona Chemical Co.

Orthoanisidine
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.

Orthochloraniline
Monsanto Chemical Co.
Verona Chemical Co.

Ortho Chlor Benzaldehyde
National Aniline & Chemical Co., Inc.

Orthochlor Paranitraniline
The Dow Chemical Co.

Orthochlorparatoluene-sodiumsulfonate
Monsanto Chemical Co.

Orthochlorphenol
Monsanto Chemical Co.

Ortho Chlor Toluene
National Aniline & Chemical Co., Inc.

Ortho Cresol
Barrett Co.
Monsanto Chemical Co.

Orthodichlorbenzene
The Dow Chemical Co.
E. I. du Pont de Nemours & Co.
Hooker Electro Chemical Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.
Niagara Alkali Co.

Orthonitraniline
Monsanto Chemical Co.

Orthonitroanisole
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.
Verona Chemical Co.

Orthonitrochlorbenzene
Monsanto Chemical Co.

Orthonitrophenol
Verona Chemical Co.

Orthonitrosometacresol
Verona Chemical Co.

Ortho Nitro Toluene
National Aniline & Chemical Co., Inc.

Ortho Toluidine
National Aniline & Chemical Co., Inc.

Orthoparatoluenesulfonamid
Monsanto Chemical Co.

Orthoparxylidine
The Calco Chemical Co.

Orthophenetidin
Monsanto Chemical Co.

***Orthotoluenesulfonamid**
Monsanto Chemical Co.

Orthotoluidine
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Orthotoluidine Hydrochloride
The Calco Chemical Co.

Orthoxenol
The Dow Chemical Co.

***Osage Orange Extract**
American Dyewood Co.

Osmometers
Eimer & Amend

Osmoscopes
Eimer & Amend

Oximes
American Chemical Products Co.

Oxyquinoline Base
Mallinckrodt Chemical Works

Oxyquinolin Benzoate
Seydel Chemical Co.

Oxyquinoline Sulfate
Mallinckrodt Chemical Works
Seydel Chemical Co.

Ozone Tubes
Eimer & Amend

Paint Anti-Skinning Materials
Monsanto Chemical Co.

***Paint Colors**
Binney & Smith Co.
E. I. du Pont de Nemours & Co.

Paint Testing Apparatus
Eimer & Amend

Paint and Varnish Thinners
Anderson-Prichard Oil Corp.

Paints
Barrett Co.
E. I. du Pont de Nemours & Co.

Papavarine Hydrochloride
Mallinckrodt Chemical Works

Paper Colors
Binney & Smith Co.
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co.

Paper, Phenolphthalein
Mallinckrodt Chemical Works

Paper Sizes
American Cyanamid & Chemical Corp.

Paper, Turmeric
Mallinckrodt Chemical Works

Paper Wax Size
National Oil Products Co.

Paramidophenol Base
The Calco Chemical Co.
Verona Chemical Co.

Paramidophenol Hydrochloride
The Calco Chemical Co.

Para Amino Acetanilide
National Aniline & Chemical Co., Inc.

Para Amino Phenol
National Aniline & Chemical Co., Inc.

Parachloraniline
Monsanto Chemical Co.

Para-Chloraniline
Verona Chemical Co.

Parachlormeta Cresol
Monsanto Chemical Co.

Parachlormeta Xylenol
Monsanto Chemical Co.

Parachlororthoanisidine
Verona Chemical Co.

Parachlororthonitraniline
Verona Chemical Co.

Parachlororthonitroanisole
Verona Chemical Co.

Parachlororthonitrophenol
Verona Chemical Co.

Parachlorphenol
Monsanto Chemical Co.

Paracresol
Monsanto Chemical Co.

Paradibrombenzene
The Dow Chemical Co.

Paradichloraniline 1-2-5
Verona Chemical Co.

Paradichlorobenzene
E. I. du Pont de Nemours & Co.
Hooker Electrochemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Niagara Alkali Co.

***Para Formaldehyde**
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Paraldehyde
Mallinckrodt Chemical Works

Paramon
Seydel Chemical Co.

Paranitraniline
The Calco Chemical Co.
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.

Para-Nitrobenzoyl Chloride
Hooker Electrochemical Co.

Paranitrochlorbenzene
Monsanto Chemical Co.

Para Nitro Dimethylaniline
National Aniline & Chemical Co., Inc.

Paranitrophenol
Monsanto Chemical Co.

Paranitrophenol Sodium
Monsanto Chemical Co.

Paranitrotoluene
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

Paraphenetidin
The Dow Chemical Co.
Monsanto Chemical Co.

Paraphenetidin Hydrochloride
Monsanto Chemical Co.

Paraphenylenediamine
The Calco Chemical Co.
Merck & Co., Inc.
Verona Chemical Co.

Para-Phenylene-Diamine Hydrochloride
Mallinckrodt Chemical Works

Paratoluenesulfonamid
Monsanto Chemical Co.

***Paratoluenesulfonchloride**
Monsanto Chemical Co.

Paratoluidine
The Calco Chemical Co.
National Aniline & Chemical Co., Inc.

Paraxenol
The Dow Chemical Co.

***Paris Green**
The Dow Chemical Co.
General Chemical Co.
Grasselli Chemical Co.
Mechling Bros. Chemical Co.

***Paste**
Binney & Smith
The Casein Manufacturing Co.

Pelletierine Tannate
Mallinckrodt Chemical Works

Penetrants
American Cyanamid & Chemical Corp.
Barrett Co.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.
National Oil Products Co.
Wolf, Jacques & Co.

Perchlorethylene
E. I. du Pont de Nemours & Co.

***Petroleum Ether**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Phenacetin
Mallinckrodt Chemical Works

Phenobarbital
Mallinckrodt Chemical Works
Seydel Chemical Co.

Phenobarbital Sodium
Mallinckrodt Chemical Works
Seydel Chemical Co.

***Phenol**
Barrett Co.
The Dow Chemical Co.
Merck & Co., Inc.
Monsanto Chemical Co.
Wishnick-Tumpeer, Inc.

***Phenol U. S. P. Crystals**
Gray, William S. & Co.
Heyden Chemical Corp.

Phenol Benzoate
Seydel Chemical Co.

Phenol Glycol Acetal
Van Dyk & Co.

***Phenolphthalein**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Pfizer, Chas. & Co., Inc.

Phenyl Acetate
The Dow Chemical Co.

Phenylhydrazine
American Chemical Products Co.
The Dow Chemical Co.

Phenylhydrazine Hydrochloride
American Chemical Products Co.

Phenyl Methyl Pyrazolone
The Dow Chemical Co.

Phenyl Salicylate
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Phloroglucinol
American Chemical Products Co.
Pennsylvania Coal Products Co.

Phosphate Rock
American Cyanamid & Chemical Corp.
Victor Chemical Works

Phosphoric Anhydride
Mallinckrodt Chemical Works
Victor Chemical Works

Phosphorus
Mallinckrodt Chemical Works

Phosphorus Oxychloride
The Dow Chemical Co.
Mallinckrodt Chemical Works

Phosphorus Pentachloride
Mallinckrodt Chemical Works

Phosphorus Trichloride
Mallinckrodt Chemical Works

***Phosphorus Yellow**
Merck & Co., Inc.
Victor Chemical Works

Phthalic Anhydride
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.
National Aniline & Chemical Co., Inc.

Phthalimide
American Cyanamid & Chemical Corp.

Phthalyl Chloride
Monsanto Chemical Co.

Pickling Inhibitors
Barrett Co.

Pigment Blocks
Wolf, Jacques & Co.

***Pigments**
Zinsser & Co.

Pilocarpine
Seydel Chemical Co.

Pilocarpine Hydrobromide
Mallinckrodt Chemical Works

Pilocarpine, Hydrochloride
Mallinckrodt Chemical Works

Pilocarpine Nitrate
Mallinckrodt Chemical Works

Piperidine
Monsanto Chemical Co.

Piperine
Mallinckrodt Chemical Works

Pipettes
Eimer & Amend

***Pitch, Burgundy**
Wishnick-Tumpeer, Inc.

Plant Lime
Columbia Alkali Co.
Michigan Alkali Co.

***Plastic Roof Cement**
Barrett Co.

Plasticizers
American Commercial Alcohol Corp.
American Cyanamid & Chemical Co.
Barrett Co.
Franco-American Chemical Works
Hamilton, A. K.
Metasap Chemical Co.
Monsanto Chemical Co.
Union Carbide & Carbon Corp.

Plastics
American Cyanamid & Chemical Corp.
Bakelite Corporation

Plastics, Colors
Binney & Smith Co.

***Platinum**
Irvington Smelting & Refining Co.

Platinum Chloride
Mallinckrodt Chemical Works

***Polishes**
National Oil Products Co.

Polishing Apparatus
Eimer & Amend

Poster Paint
Binney & Smith Co.

***Potash**
American Cyanamid & Chemical Corp.
U. S. Industrial Alcohol Co.
U. S. Potash Co.

Potash, Sulfurated
Mallinckrodt Chemical Works

Pneumo Thorax Apparatus
Eimer & Amend

Potassium
Mallinckrodt Chemical Works

Potassium Acetate
Mallinckrodt Chemical Works

***Potassium Acetate**
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Potassium Acid Phthalate
Mallinckrodt Chemical Works

Potassium Arsenate
Mallinckrodt Chemical Works

Potassium Arsenite
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Potassium Amyl Xanthate
Monsanto Chemical Co.

Potassium Benzoate
Seydel Chemical Co.

Potassium Bicarbonate
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Potassium Bichromate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Potassium Bifluoride
Sterling Products Co.

Potassium Binoxalate
Mallinckrodt Chemical Works

***Potassium Biphosphate**
Merck & Co., Inc.

Potassium Bisulfate
Mallinckrodt Chemical Works

Potassium Bisulfite
Mallinckrodt Chemical Works

Potassium Bitartrate
Mallinckrodt Chemical Works

Potassium Boro-Tartrate
Mallinckrodt Chemical Works

Potassium Bromate
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Potassium Bromide**
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Potassium Butyl Xanthate
Monsanto Chemical Co.

Potassium Carbonate
Innis, Speiden & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Niagara Alkali Co.
Pfizer, Chas. & Co., Inc.
Wishnick-Tumpeer, Inc.

Potassium Chlorate
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

***Potassium Chloride**
The Dow Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Potassium Chromate
Mallinckrodt Chemical Works

***Potassium Citrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Potassium Creosote-Sulfonate
Mallinckrodt Chemical Works

***Potassium Cyanide**
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Potassium Ethyl Xanthate
Monsanto Chemical Co.

***Potassium Ferricyanide**
Mallinckrodt Chemical Works
Mallinckrodt Chemical Works

***Potassium Ferrocyanide**
Mallinckrodt Chemical Works

Potassium Fluoride
Mallinckrodt Chemical Works

Potassium Gluconate
Pfizer, Chas. & Co., Inc.

Potassium Glycerophosphate
Heyden Chemical Corp.
Mallinckrodt Chemical Works

Potassium Guaiacol Sulfonate
Heyden Chemical Corp.
Mallinckrodt Chemical Works

Potassium Hypophosphite
Mallinckrodt Chemical Works

Potassium Iodate
Mallinckrodt Chemical Works

***Potassium Bromate**
The Dow Chemical Co.

***Potassium Iodide**
The Dow Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

Potassium Meta-Bisulfite
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Potassium Nitrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Stauffer Chemical Co.
Wishnick-Tumpeer, Inc.

Potassium Nitrite
Mallinckrodt Chemical Works

Potassium Oxalate
Mallinckrodt Chemical Works
Merck & Co., Inc.

Potassium Permanganate
Carus Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

***Potassium Phosphate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Potassium Phosphate Dibasic**
Merck & Co., Inc.

Potassium Salicylate
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Potassium Silicate
E. I. du Pont de Nemours & Co.
The Grasselli Chemical Co.

Potassium Sodium Tartrate
Mallinckrodt Chemical Works

***Potassium Sulfate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Potassium Sulfide**
Mallinckrodt Chemical Works

***Potassium Sulfite**
Mallinckrodt Chemical Works

Potassium Sulfocyanate
Mallinckrodt Chemical Works

***Potassium Tartrate**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Potassium Tetraoxalate
Mallinckrodt Chemical Works

Potassium Thiocyanate
Mallinckrodt Chemical Works

Powdered Tin
Wolf, Jacques & Co.

Printing Gums
Wolf, Jacques & Co.

Procaine Base
Seydel Chemical Co.

Procaine Hydrochloride
Mallinckrodt Chemical Works
Seydel Chemical Co.

Proflavine Hydrochloride
National Aniline & Chemical Co., Inc.

Propane
Union Carbide & Carbon Corp.

Propionyl Chloride
Hooker Electrochemical Co.

Propyl Acetate
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Propyl Butyrates
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Propyl Formate
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Propyl Para-Hydroxy Benzoate
Heyden Chemical Corp.

Propyl Propionate
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Propylene
Union Carbide & Carbon Corp.

Propylene Chlorhydrin
Union Carbide & Carbon Corp.

Propylene Dichloride
The Dow Chemical Co.
Union Carbide & Carbon Corp.

Propylene Glycol
Union Carbide & Carbon Corp.

Propylene Oxide
Union Carbide & Carbon Corp.

Prussiate Potash Yellow
American Cyanamid & Chemical Corp.
Merck & Co., Inc.

Prussiate Soda Yellow
American Cyanamid & Chemical Corp.

Pyridine
Barrett Co.
Mallinckrodt Chemical Works
Monsanto Chemical Co.

Pyroxylin
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works

Pyroxylin Cements
Monsanto Chemical Co.

Pyroxylin Plastics
E. I. du Pont de Nemours & Co.

***Quercitron Bark Extract**
American Dyewood Co.

Quinhydrone
American Chemical Products Co.

Quinidine Alkaloid
Mallinckrodt Chemical Works

Quinidine Sulfate
Mallinckrodt Chemical Works

Quinine Alkaloid
Mallinckrodt Chemical Works

***Quinine and Salts**
Mallinckrodt Chemical Works
Merck & Co., Inc.
N. Y. Quinine & Chemical Co.

Quinirarine
National Aniline & Chemical Co., Inc.

Quinoline
Barrett Co.

Quinone
Carus Chemical Co.

R-Salt
National Aniline & Chemical Co., Inc.

Radiator Cleaners
Sterling Products Co.

Reagent Chemicals
General Chemicals Co.

Recovered Manganese Dioxide
Carus Chemical Co.

***Red Lead**
Wishnick-Tumpeer, Inc.

Refined Tar
Barrett Co.
Monsanto Chemical Co.

Reflection Meters
Eimer & Amend

Refrigerants
E. I. du Pont de Nemours & Co.

Resins
American Cyanamid & Chemical Corp.
Bakelite Corporation
Barrett Co.
John D. Lewis
Union Carbide & Carbon Corp.

Resorcinol
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pennsylvania Coal Products Co.

Resorcinol Monoacetate
Seydel Chemical Co.

Retorts
Eimer & Amend

Rhodinol
Van Dyk & Co.

Rhodinyl Acetate
Van Dyk & Co.

Rice Starch
Wishnick-Tumpeer, Inc.

***Rochelle Salt**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Rose Dust
The Grasselli Chemical Co.

Rosin Size
Wolf, Jacques & Co.

Rotogravure Iron
The Dow Chemical Co.

Rubber Accelerators
American Cyanamid & Chemical Corp.
Barrett Co.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.

Rubber Chemical Speciaties
Binney & Smith Co.

Rubber Colors
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Rust Inhibites
The Grasselli Chemical Co.

Rubber Latex Wetting Out Agent
Monsanto Chemical Co.

Rubber Offset Blanket Wash
Anderson-Prichard Oil Corp.

Rubber Roll
Anderson-Prichard Oil Corp.

Rubber Solution
Mallinckrodt Chemical Works

Rubber Solvents
Anderson-Prichard Oil Corp.

Rubber Testing Apparatus
Eimer & Amend

Rye Bread Improver
Innis, Speiden & Co.

***Saccharine**
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.

***Sal Soda**
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

***Salol**
Heyden Chemical Corp.
Mallinckrodt Chemical Works

***Salt**
Columbia Alkali Co.
The Dow Chemical Co.
Merck & Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

***Salt Cake**
American Cyanamid & Chemical Corp.
General Chemical Co.
The Grasselli Chemical Co.
Pennsylvania Salt Mfg. Co.

***Salt of Tartar**
Pfizer, Chas. & Co., Inc.

Salvarsan Apparatus
Eimer & Amend

Samplers
Eimer & Amend

Sand Testing Apparatus
Eimer & Amend

Sanguinarine Nitrate
Mallinckrodt Chemical Works

Santonin
Mallinckrodt Chemical Works

Saponin
Mallinckrodt Chemical Works
Merck & Co., Inc.

Satin White
American Cyanamid & Chemical Corp.

Scarlet Red-Biebrich
National Aniline & Chemical Co., Inc.

Schaeffer Salt
National Aniline & Chemical Co., Inc.

Scrooping Compounds
American Cyanamid & Chemical Corp.
National Oil Products Co.
Wolf, Jacques & Co.

***Seed Disinfectants**
E. I. du Pont de Nemours & Co.

***Seedmeal Glues**
The Casein Manufacturing Co.

***Seidlitz Mixture**
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Shellac Testing Apparatus
Eimer & Amend

Shingle
Barrett Co.

***Silica**
Innis, Speiden & Co.
Wishnick-Tumpeer, Inc.

Silicon Tetrachloride
Stauffer Chemical Co.

Silk Finishes
Wolf, Jacques & Co.

***Silver**
Irvington Smelting & Refining Co.
Mallinckrodt Chemical Works

Silver, Acetate
Mallinckrodt Chemical Works

Silver Carbonate
Mallinckrodt Chemical Works

***Silver Chloride**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Silver Cyanide**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Silver Iodide
Mallinckrodt Chemical Works

Silver Lactate
Mallinckrodt Chemical Works

***Silver Nitrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Silver Nitrite
Mallinckrodt Chemical Works

Silver Nucleinate
Mallinckrodt Chemical Works

Silver Oxide
Mallinckrodt Chemical Works

Silver Phosphate
Mallinckrodt Chemical Works

***Silver Protein**
Heyden Chemical Corp.

Silver Sulfate
Mallinckrodt Chemical Works

***Smoked Salt**
Pennsylvania Salt Mfg. Co.

Sneeze Gas
Sterling Products Co.

***Soap**
H. Kohnstamm & Co.
National Oil Products Co.

Soap, Liquid
American Chemical Products Co.

Sobenate
Seydel Chemical Co.

Soda Ash
Columbia Alkali Co.
Mathieson Alkali Works, Inc.
Michigan Alkali Co.
Pennsylvania Salt Mfg. Co.
Southern Alkali Corp.

***Soda Caustic**
Columbia Alkali Co.
The Dow Chemical Co.
Hooker Electrochemical Co.
Innis, Speiden & Co.
Mallinckrodt Chemical Works
Mathieson Alkali Works, Inc.
Merck & Co., Inc.
Michigan Alkali Co.
Monsanto Chemical Co.
Niagara Alkali Co.
Pennsylvania Salt Mfg. Co.
Southern Alkali Corp.
Stauffer Chemical Co.
Warner Chemical Co.

***Sodas Modified**
Columbia Alkali Co.
Mathieson Alkali Works
Michigan Alkali Co.
Pennsylvania Salt Mfg. Co.
Southern Alkali Corp.

***Sours**
H. Kohnstamm & Co.

***Sodium**
Mallinckrodt Chemical Works

***Sodium Acetate**
The Dow Chemical Co.
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Wishnick-Tumpeer, Inc.

Sodium Acetate Anhydrous
Monsanto Chemical Co.

Sodium Acid-Phosphate
Mallinckrodt Chemical Works
Victor Chemical Works

Sodium Aluminate
American Cyanamid & Chemical Corp.
Monsanto Chemical Co.
National Aluminate Corp.
Pennsylvania Salt Mfg. Co.

Sodium Arsenate
Mallinckrodt Chemical Works
Merck & Co., Inc.

Sodium Arsenite
Mallinckrodt Chemical Works

Sodium Azide
American Chemical Products Co.

***Sodium Benzoate**
Carus Chemical Co.
Heyden Chemical Corp.
Hooker Electrochemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Seydel Chemical Co.

Sodium Benzol Succinate
Seydel Chemical Co.

***Sodium Bicarbonate**
Columbia Alkali Co.
General Chemical Co.
Mallinckrodt Chemical Works
Mathieson Alkali Works, Inc.
Merck & Co., Inc.
Michigan Alkali Co.
Pennsylvania Salt Mfg. Co.
Southern Alkali Corp.

*Sodium Bichromate
The Martin Dennis Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Sodium Bifluoride
General Chemical Co.
Sterling Products Co.

*Sodium Bismuthate
Mallinckrodt Chemical Works

*Sodium Bi-Sulfate
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

*Sodium Bisulfite
General Chemical Co.
Mallinckrodt Chemical Works
Mechling Bros. Chemical Co.
Merck & Co., Inc.

*Sodium Bitartrate
Mallinckrodt Chemical Works

Sodium 2-Brom Paraxenate
The Dow Chemical Co.

*Sodium Bromate
The Dow Chemical Co.
Mallinckrodt Chemical Works

*Sodium Bromide
The Dow Chemical Co.
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Sodium Cacodylate
Mallinckrodt Chemical Works

Sodium 6-Chlor Orthoxenate
The Dow Chemical Co.

Sodium Chlorate
The Grasselli Chemical Co.
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Sodium Choleate
Mallinckrodt Chemical Works

Sodium Chromate
Mallinckrodt Chemical Works
Merck & Co., Inc.

Sodium Cinchophenate
Pfizer, Chas. & Co., Inc.

*Sodium Citrate
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Sodium Cobalt Nitrite
Mallinckrodt Chemical Works

Sodium Cyanide
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Sodium Ethyl Xanthate
Monsanto Chemical Co.

*Sodium Ferrocyanide
Bower, Henry Chemical Mfg. Co.
Mallinckrodt Chemical Works

Sodium Fluoride
General Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Sodium Fluosilicate
E. I. du Pont de Nemours & Co.
The Grasselli Chemical Co.

Sodium Formate
Mallinckrodt Chemical Works
Victor Chemical Works

Sodium Gluconate
Pfizer, Chas. & Co., Inc.

Sodium Glycerophosphate
Heyden Chemical Corp.
Mallinckrodt Chemical Works

Sodium Glycocholate
Mallinckrodt Chemical Works

*Sodium Hydrosulfite
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
National Aniline & Chemical Co., Inc.
Wolf, Jacques & Co.

*Sodium Hypochlorite
Mathieson Alkali Works, Inc.
Merck & Co., Inc.
Monsanto Chemical Co.
Pennsylvania Salt Mfg. Co.
Mallinckrodt Chemical Works

*Sodium Hyposulfite
General Chemical Co.
Mallinckrodt Chemical Works
Mechling Bros. Chemical Co.
Merck & Co., Inc.

Sodium Hyposulfite Hyporice
Mallinckrodt Chemical Works

Sodium Iodate
Mallinckrodt Chemical Works

*Sodium Iodide
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Sodium Lactate
Mallinckrodt Chemical Works

Sodium Meta-Bisulfite
Mallinckrodt Chemical Works

Sodium Metanilate
National Aniline & Chemical Co., Inc.

Sodium Metaphosphate
E. I. du Pont de Nemours & Co.
Victor Chemical Works

Sodium Metasilicate
General Chemical Co.
Mechling Bros. Chemical Co.

Sodium Molybdate
Mallinckrodt Chemical Works

Sodium Naphthionate
National Aniline & Chemical Co., Inc.

Sodium Nitrate
Barrett Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

Sodium Nitrite
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works

Sodium Nitroferricyanide
Mallinckrodt Chemical Works

Sodium Orthoxenate
The Dow Chemical Co.

Sodium Oxalacetate
U. S. Industrial Alcohol Co.

Sodium Oxalate
Mallinckrodt Chemical Works
Victor Chemical Works

Sodium Perborate
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Sodium Permanganate
Carus Chemical Co.

*Sodium Peroxide
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works

Sodium Phenate
Monsanto Chemical Co.

*Sodium Phosphate
American Cyanamid & Chemical Co.
General Chemical Co.
The Grasselli Chemical Co.
Merck & Co., Inc.
Victor Chemical Co.
Warner Chemical Co.

Sodium Phosphite
Mallinckrodt Chemical Works

Sodium Picramate
The Calco Chemical Co.

Sodium Potassium Bismutho-Tartrate
Mallinckrodt Chemical Works

*Sodium Pyrophosphate
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.
Victor Chemical Works

*Sodium Salicylate
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Pfizer, Chas. & Co., Inc.

Sodium Santoninate
Mallinckrodt Chemical Works

*Sodium Silicate
American Cyanamid & Chemical Corp.
General Chemical Co.
Mechling Bros. Chemical Co.
Merck & Co., Inc.
Stauffer Chemical Co.

*Sodium Silico-Fluoride
The Grasselli Chemical Co.
Gray, William S. & Co.

Sodium Stearate
Mallinckrodt Chemical Works

Sodium Succinate
Mallinckrodt Chemical Works
Seydel Chemical Co.

Sodium Sulfanilate
National Aniline & Chemical Co., Inc.

***Sodium Sulfide**
The Dow Chemical Co.
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Monsanto Chemical Co.
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

***Sodium Sulfite**
E. I. du Pont de Nemours & Co.
General Chemical Co.
Mallinckrodt Chemical Works
Mechling Bros., Chemical Co.
Merck & Co., Inc.
Monsanto Chemical Co.

Sodium Sulfo-carbolate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Sodium Sulfocyanate
Mallinckrodt Chemical Works
Merck & Co., Inc.

Sodium Sulfonilate
Verona Chemical Co.

Sodium Sulfoxalate
E. I. du Pont de Nemours & Co.

Sodium Tartrate
Mallinckrodt Chemical Works

Sodium-2-4-5-6 Tetrachlor Phenate, Technical
The Dow Chemical Co.

Sodium Thiocyanate
Mallinckrodt Chemical Works

Sodium Thiosulphate
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

Sodium-2-4-5 Trichlor Phenate
The Dow Chemical Co.

Sodium Tungstate
Mallinckrodt Chemical Works

Sodium-Zinc Alloy
E. I. du Pont de Nemours & Co.

Sodium and Ammonium Phosphate
Mallinckrodt Chemical Works

Soft Formaldehyde Aniline
Monsanto Chemical Co.

Soil Analysis Apparatus
Eimer & Amend

Soil Iron
Stauffer Chemical Co.

***Solution Antimony Chloride**
Merck & Co., Inc.

Solutions
Eimer & Amend

***Solvent Naphtha**
Barrett Co.
Gray, William S. & Co.

Spanish Red Oxides
Wishnick-Tumpeer, Inc.

Special Esters
American Commercial Alcohol Corp.
E. I. du Pont de Nemours & Co.
Hamilton, A. K.
Franco-American Chemical Works
Pennsylvania Alcohol Corp.

Special Resinoids
Bakelite Corporation

Special Salt
Hooker Electrochemical Co.

Specimen Tubes
Eimer & Amend

Spirit of Chloroform
Mallinckrodt Chemical Works

Spirit of Ethyl Nitrite
Mallinckrodt Chemical Works

Spreaders
Casein Mfg. Co.
Mechling Bros. Chemical Co.

***Stain Removers**
H. Kohnstamm & Co.

Stains
Eimer & Amend

***Stannic Chloride**
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

***Stannous Chloride**
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

***Starches**
H. Kohnstamm & Co.

Steam Black
Wolf, Jacques & Co.

Stearic Acid Softeners
Wolf, Jacques & Co.

Stirrers
Eimer & Amend

Stopcock Removers
Eimer & Amend

Stopcocks, Glass
Eimer & Amend

Strontium Acetate
Mallinckrodt Chemical Works

***Strontium Bromide**
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Strontium Carbonate
Mallinckrodt Chemical Works

Strontium Chloride
E. I. du Pont de Nemours & Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

Strontium Iodide
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Strontium Lactate
Mallinckrodt Chemical Works

Strontium Nitrate
The Grasselli Chemical Co.
Mallinckrodt Chemical Works

Strontium Oxalate
Mallinckrodt Chemical Works

Strontium Peroxide
Mallinckrodt Chemical Works

Strontium Salicylate
Heyden Chemical Corp.
Mallinckrodt Chemical Works
Monsanto Chemical Co.
Pfizer, Chas. & Co., Inc.

Strontium Sulfate
Mallinckrodt Chemical Works

Strontium Sulfide
Mallinckrodt Chemical Works

Structural Products
American Cyanamid & Chemical Corp.

Strychnine Acetate
Pfizer, Chas. & Co., Inc.

***Strychnine Alkaloid**
Mallinckrodt Chemical Works
Merck & Co., Inc.
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.
Platt-Forbes, Inc.

Strychnine Arsenate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Strychnine Arsenite
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Strychnine Citrate with Iron
Pfizer, Chas. & Co., Inc.

Strychnine Glycerophosphate
Mallinckrodt Chemical Works

Strychnine Hydrochloride
Pfizer, Chas. & Co., Inc.

Strychnine Hypophosphate
Pfizer, Chas. & Co., Inc.

Strychnine Hypophosphite
Mallinckrodt Chemical Works

Strychnine Nitrate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

Strychnine Phosphate
Mallinckrodt Chemical Works
Pfizer, Chas. & Co., Inc.

***Strychnine Sulfate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

Subenon
Seydel Chemical Co.

Sublimators
Eimer & Amend

Succinic Anhydride
American Cyanamid & Chemical Corp.
National Aniline & Chemical Co., Inc.

Sucrose
Mallinckrodt Chemical Works

Sugar Testers
Eimer & Amend

Sulfarsphenamine
Mallinckrodt Chemical Works

Sulfonated Tallow
Wolf, Jacques & Co.

***Sulfur**
American Cyanamid & Chemical Corp.
Freeport Sulphur Co.
General Chemical Co.
Mallinckrodt Chemical Works
Mechling Bros. Chemical Co.
Merck & Co., Inc.
Monsanto Chemical Co.
Stauffer Chemical Co.
Texas Gulf Sulphur Co., Inc.
Wishnick-Tumpeer, Inc.

Sulfur Black Developers
Wolf, Jacqes & Co.

***Sulfur Chloride**
The Calco Chemical Co.
Innis, Speiden & Co.
Stauffer Chemical Co.
Wishnick-Tumpeer, Inc.

***Sulfur Chloride, Red**
The Dow Chemical Co.

***Sulfur Chloride, Yellow**
The Dow Chemical Co.

Sulfur Colors
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

***Sulfur Dichloride**
Hooker Electrochemical Co.
Stauffer Chemical Co.
Warner Chemical Co.

Sulfur Dioxide
The Calco Chemical Co.

Sulfur Iodide
Pfizer, Chas. & Co., Inc.

***Sulfur Monochloride**
The Dow Chemical Co.
Hooker Electrochemical Co.
Warner Chemical Co.

Sulfur Testers
Eimer & Amend

Sulfuryl Chloride
Hooker Electrochemical Co.
Monsanto Chemical Co.

Super Phosphate
Pennsylvania Salt Mfg. Co.

Synthetic Rubber
E. I. du Pont de Nemours & Co.

Synthetic Tanning Materials
Barrett Co.
Monsanto Chemical Co.

***Talc**
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

***Tanners Finishes**
American Cyanamid & Chemical Corp.
Innis, Speiden & Co.
Martin Dennis Co.
National Oil Products Co.
Wolf, Jacques & Co.

***Tanners Prepared Blood**
Innis, Speiden & Co.

***Tanners Sizes**
Innis, Speiden & Co

Tannin
Pfizer, Chas & Co., Inc.

Tanning Materials, Synthetic
American Cyanamid & Chemical Corp.

Tanning Specialties
American Cyanamid & Chemical Corp.
The Grasselli Chemical Co.
The Martin Dennis Co.
National Oil Products Co.

***Tartar Emetic**
John D. Lewis, Inc.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Tear Resisters
Barrett Co.

Terebene
Mallinckrodt Chemical Works

Terpin Hydrate
Mallinckrodt Chemical Works
Seydel Chemical Co.

Terpineol
E. I. du Pont de Nemours & Co.
Merck & Co., Inc.

Terpinyl Acetate
Van Dyk & Co.

Tetrachlorbenzene 1: 2: 4: 5
Hooker Electrochemical Co.

Tetrachlorethane
The Dow Chemical Co.

Tetrachlorethylene
The Dow Chemical Co.

2-4-5-6 Tetrachlor Phenol, Technical
The Dow Chemical Co.

Tetra Chlor Phthalic Anhydride
National Aniline & Chemical Co., Inc.

Tetradol Emulsion
National Aniline & Chemical Co., Inc.

Tetraiodophenolphthalein Sodium Salt
National Aniline & Chemical Co., Inc.

***Tetra Sodium Pyro Phosphate**
Victor Chemical Works
Warner Chemical Co.

Textile Dull Finishes and Delustres
Seydel Chemical Co.
Wolf, Jacques & Co.

Textile Sizes
American Cyanamid & Chemical Corp.
Seydel Chemical Co.
Wolf, Jacques & Co.

Textile Strippers
Wolf, Jacques & Co.

Textile Thickeners
Wolf, Jacques & Co.

Textile Waterproofing Agents
Wolf, Jacques & Co.

Theobromine, Alkaloid
Mallinckrodt Chemical Works

Theobromine Salicylate
Mallinckrodt Chemical Works

Theobromine and Sodium Acetate
Mallinckrodt Chemical Works

Theobromine Sodio-Salicylate
Mallinckrodt Chemical Works

Theophylline
Mallinckrodt Chemical Works

Thermometers
Eimer & Amend

Thermostats
Eimer & Amend

Thiocarbamide
Merck & Co., Inc.

Thiocarbanilide
Monsanto Chemical Co.

Thiosinamine
Mallinckrodt Chemical Works
National Aniline & Chemical Co., Inc.

Thiourea
Merck & Co., Inc., Inc.

Thinners
Anderson-Prichard Chemical Co.
Barrett Co.
Monsanto Chemical Co.

Thionyl Chloride
Hooker Electrochemical Co.
Monsanto Chemical Co.

Thymol
Mallinckrodt Chemical Works
Merck & Co., Inc.

Thymol Iodide
Mallinckrodt Chemical Works
New York Quinine & Chemical Works
Pfizer, Chas. & Co., Inc.

Tin
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Tin Crystals**
General Chemical Co.
Grasselli Chemical Co.
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.
Wolf, Jacques & Co., Inc.

Tin Muriate
Mallinckrodt Chemical Works

***Tin Oxide**
Mallinckrodt Chemical Works
Merck & Co., Inc.

Tin Tetrachloride
General Chemical Co.
Grasselli Chemical Co.
Wolf, Jacques & Co.

***Tincture Iodine**
Mallinckrodt Chemical Works

Tinning Flux
The Grasselli Chemical Co.

Titanium Pigments
E. I. du Pont de Nemours & Co.

Titanium Tetrachloride
Stauffer Chemical Co.

Titanium Trichloride
Stauffer Chemical Co.

Titanyl Sulfate
E. I. du Pont de Nemours & Co.
The Grasselli Chemical Co.

Tolazine
National Aniline & Chemical Co., Inc.

Toluidine
Barrett Co.
E. I. du Pont de Nemours & Co.

Tolidine
National Aniline & Chemical Co., Inc.

***Toluol**
Barrett Co.
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Transparent Cellulose Wrapping Material
E. I. du Pont de Nemours & Co.

Transport Number Apparatus
Eimer & Amend

Tree Bands
American Cyanamid & Chemical Corp.

Triacetine
American Commercial Alcohol Corp.

Triasol
Union Carbide & Carbon Corp.

Tributylamine
E. I. du Pont de Nemours & Co.

Tricalcium Phosphate
Victor Chemical Works

Trichlorbenzene
The Dow Chemical Co.
Hooker Electrochemical Co.

Trichlorethylene
The Dow Chemical Co.
E. I. du Pont de Nemours & Co.
Union Carbide & Carbon Corp.

2-4-5 Trichlorphenol
The Dow Chemical Co.

Tricresyl Phosphate
Hamilton, A. K.
Franco-American Chemical Works
Monsanto Chemical Co.
Pennsylvania Alcohol Corp.

Triethanolamine
Union Carbide & Carbon Co.

Triethylene Glycol
Union Carbide & Carbon Co.

***Trioxmethylene**
Merck & Co., Inc.

Triphenylguanidine
E. I. du Pont de Nemours & Co.
National Aniline & Chemical Co., Inc.

Triphenyl Phosphate
The Dow Chemical Co.
Monsanto Chemical Co.

Triple Superphosphate
Victor Chemical Works

***Trisodium Phosphate**
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
General Chemical Co.
The Grasselli Chemical Co.
Mechling Bros. Chemical Co.
Merck & Co., Inc.
Monsanto Chemical Co.
Victor Chemical Works
Warner Chemical Co.

Turf Fungicide
American Cyanamid & Chemical Corp.

***Turpentine**
Gray, William S. & Co.

Turpentine Testing Apparatus
Eimer & Amend

Uranium Acetate
Mallinckrodt Chemical Works

Uranium Nitrate
Mallinckrodt Chemical Works

Urea
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Urea-Ammonia Liquor
E. I. du Pont de Nemours & Co.

Urea Nitrate
Sterling Products Co.

Vallet's Mass
Pfizer, Chas. & Co., Inc.

***Vanillin**
Monsanto Chemical Co.
Merck & Co., Inc.

Vapor Density Apparatus
Eimer & Amend

Varnish Anti-Skinning Agents
Monsanto Chemical Co.

Varnish Testers
Eimer & Amend

Varnishes
Bakelite Corporation
E. I. du Pont de Nemours & Co.

Vat Colors
The Calco Chemical Co.
E. I. du Pont de Nemours & Co.
John D. Lewis, Inc.
National Aniline & Chemical Co., Inc.

Vinyl Chloride
Union Carbide & Carbon Corp.

Violet Ketone (Ionone)
Van Dyk & Co.

Viscose Rayon
E. I. du Pont de Nemours & Co.

Viscosimeters
Eimer & Amend

Volumeters
Eimer & Amend

Volumetric Solutions
Mallinckrodt Chemical Works

Wall Sealers
The Casein Manufacturing Co.

Wallpaper Colors
Binney & Smith Co.

Warp Conditioners
Wolf, Jacques & Co.

Warp Sizes
Wolf, Jacques & Co.

***Water Colors**
Binney & Smith Co.

***Water-proofing Compounds**
National Oil Products Co.

***Water Softeners**
Pennsylvania Salt Mfg. Co.

Water Testing Apparatus
Eimer & Amend

Water Treating Chemicals
National Aluminate Corp.

Wax, Bees
Innis, Speiden & Co.

Wax, Canauba
Innis, Speiden & Co.

Wax Ceresine
Innis, Speiden & Co.

Wax Emulsions
National Oil Products Co.

Wax, Ozokerite
Innis, Speiden & Co.

Wax Soluble
Wolf, Jacques & Co.

Wax Synthetic
E. I. du Pont de Nemours & Co.

Wax Testers
Eimer & Amend

***Weed Killers**
General Chemical Co.
The Grasselli Chemical Co.
Mechling Bros. Chemical Co.

Weighting Compounds
Wolf, Jacques & Co.

Weighting Gum
Wolf, Jacques & Co.

Wetting Out Agents
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.
Synthetic Chemicals, Inc.
Wolf, Jacques & Co.

White Precipitate
Pfizer, Chas. & Co., Inc.

***Whiting**
Columbia Alkali Co.
Stauffer Chemical Co.
Wishnick-Tumpeer, Inc.

Wilson's Mixture
Pfizer, Chas. & Co., Inc.

Winding and Coning Oils
Wolf, Jacques & Co.

Wood Flour
Wishnick-Tumpeer, Inc.

Wood Oils
Wolf, Jacques & Co.

Wood Preservatives
Barrett Co.
The Grasselli Chemical Co.
Heyden Chemical Co.
Wolf, Jacques & Co.

Wool Scouring Compounds
Wolf, Jacques & Co.

Xylenols
Barrett Co.

Xylidine
National Aniline & Chemical Co., Inc.

Xylol
Barrett Co.
Gray, William S. & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Yohimbin Hydrochloride
Seydel Chemical Co.

***Zinc**
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

***Zinc Acetate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Zinc Ammonium Chloride**
The Grasselli Chemical Co.
Warner Chemical Co.

Zinc Anodes
The Grasselli Chemical Co.

Zinc Benzoate
Seydel Chemical Co.

Zinc Borate
Mallinckrodt Chemical Works

Zinc Bromide
Mallinckrodt Chemical Works

***Zinc Carbonate**
Mallinckrodt Chemical Works
Wishnick-Tumpeer, Inc.

***Zinc Chloride**
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Warner Chemical Co.
Wishnick-Tumpeer, Inc.

***Zinc Cyanide**
American Cyanamid & Chemical Corp.
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Zinc Dust**
The Grasselli Chemical Co.

Zinc Iodide
Mallinckrodt Chemical Works

***Zinc Nitrate**
Mallinckrodt Chemical Works
Merck & Co., Inc.

***Zinc Oxide**
E. I. du Pont de Nemours & Co.
General Chemical Co.
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Zinc Permanganate
Carus Chemical Co.
Mallinckrodt Chemical Works

Zinc Peroxide
E. I. du Pont de Nemours & Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.

Zinc Phosphate
Mallinckrodt Chemical Works

Zinc Phosphide
Mallinckrodt Chemical Works

Zinc Salicylate
Mallinckrodt Chemical Works

Zinc, Sodium Alloy
The Grasselli Chemical Co.

***Zinc Stearate**
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Zinc Subbenzoate
Mallinckrodt Chemical Works

***Zinc Sulphate**
The Grasselli Chemical Co.
Mallinckrodt Chemical Works
Merck & Co., Inc.
Wishnick-Tumpeer, Inc.

Zinc Sulfite
Mallinckrodt Chemical Works

Zinc Sulfocarbolate
Merck & Co., Inc.
Pfizer, Chas. & Co., Inc.

Zinc Valerate
Mallinckrodt Chemical Works

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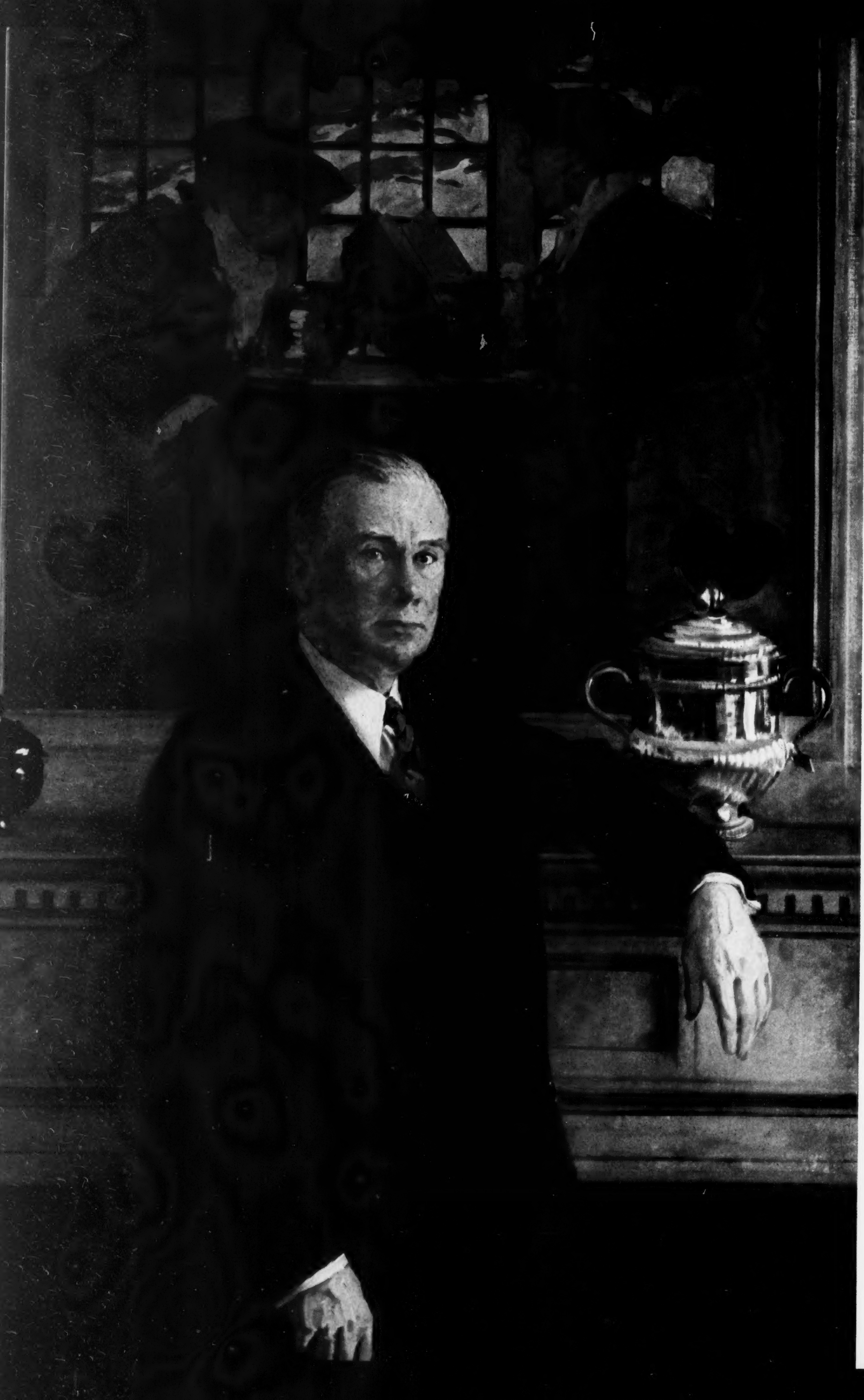

FRANCIS P. GARVAN

President Chemical Foundation

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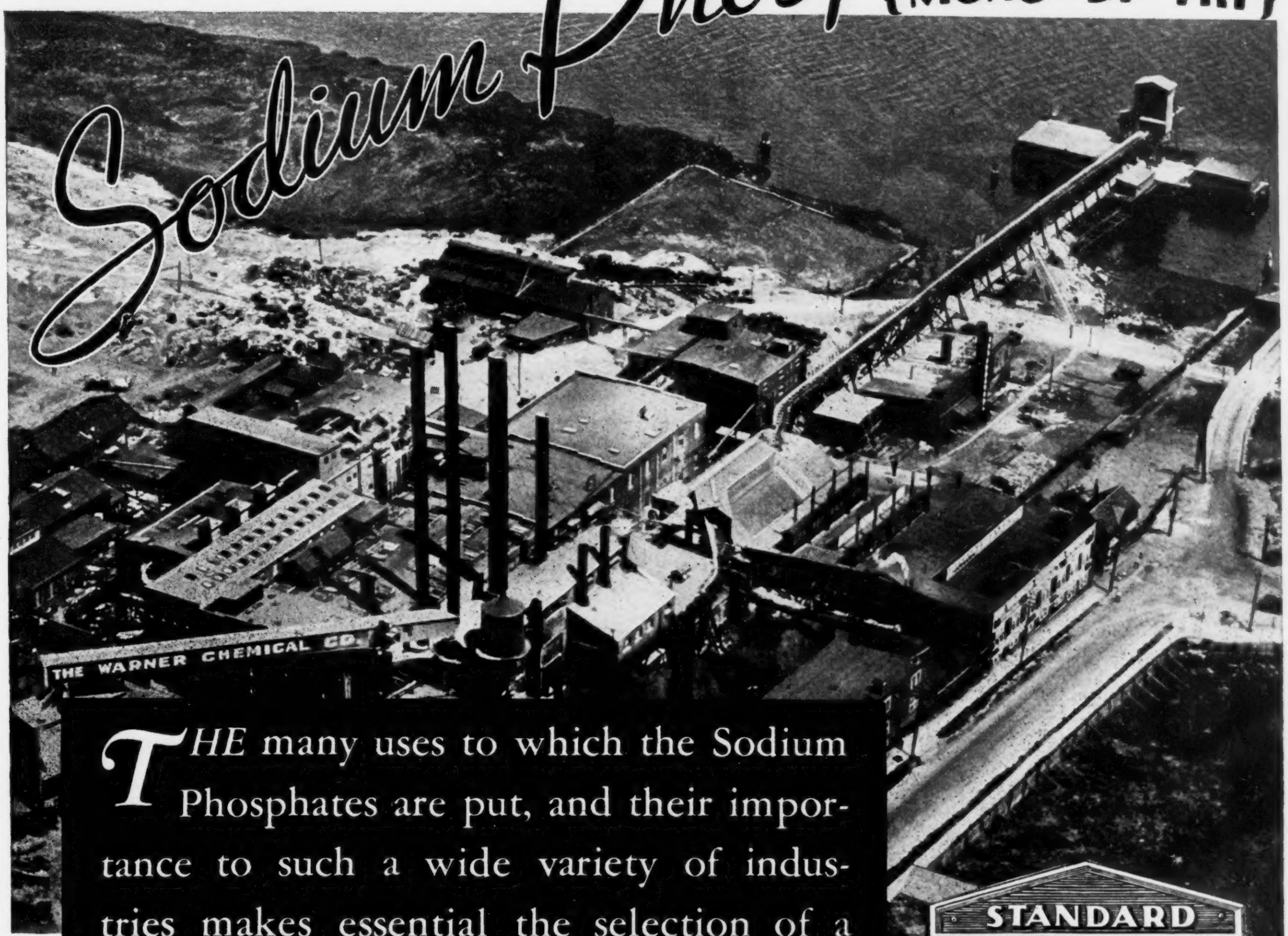
Sodium Phosphates {MONO-DI-TRI}



THE many uses to which the Sodium Phosphates are put, and their importance to such a wide variety of industries makes essential the selection of a Brand that assures Highest Quality and Uniformity as well as having behind it a dependable source of supply.

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Blanc Fixe
Carbon Bisulphide
Carbon Tetrachloride
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Caustic Soda, *Liquid*
Caustic Soda, *Solid*
Caustic Soda, *Flake*
Sodium Hypochlorite Solution
Sodium Sulphide
Sulphur Chloride
Yellow and *Red*
Water Treating Compounds

WARNER
Chemical Company

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70 RICKARD STREET · SAN FRANCISCO

DIVISION OF WESTVACO CHLORINE PRODUCTS CORPORATION

CHEMICAL INDUSTRIES

FORMERLY KNOWN AS "CHEMICAL MARKETS"

VOLUME XXXVI | JUNE, 1935 | NUMBER 6

Contents for June, 1935

CHEMICAL INDUSTRIES *is indexed regularly in the* INDUSTRIAL ARTS INDEX

Regular Departments

CHEMICAL INDUSTRIES is published monthly by Chemical Markets, Inc. WILLIAMS HAYNES, *President*; H. H. ADAMS, *Vice-President*; WILLIAM F. GEORGE, *Secretary-Treasurer*.

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Where Niagara's "Wild Horses" *are harnessed into* MATHIESON SERVICE

Aerial view of industrial Niagara Falls, with Mathieson's Niagara Plant in the foreground extending for blocks along Buffalo Avenue, and with the Niagara River showing in the background.

POWER, the all-important factor in so many manufacturing processes, brought Mathieson to Niagara nearly forty years ago. It was here that Mathieson established the first unit in America for the electrolytic production of caustic soda and chlorine products.

Today, after almost two-score years of steady expansion, Mathieson's chief "raw material" continues to be the abundant hydro-electric power of Niagara. From the raging torrents of this world-famous waterfall Mathieson draws the thousands of horsepower needed in the production of Mathieson Liquid Chlorine, Niagara Caustic Soda, Bleaching Powder, Ammonia and HTH Products.

To the "wild horses" of Niagara are harnessed abundant and nearby sources of raw materials, up-to-date manufacturing facilities, trained plant personnel, ample container equipment, excellent transportation facilities and experienced traffic counsel. The result is Mathieson service, prompt, smooth-running, dependable.

Mathieson Chemicals

The Reader Writes:—

Tut, tut! Such Language!

I read everything you print—except your damned editorials, and everything is fine, every department, even the 'ads'—except your damned editorials. Why don't you issue a "Me and the Saturday Evening Post Sore Head Department" and send it to the six or seven people that like them? But please don't include your damned editorials with each issue.

Why not spend more of your time travelling around and tell us what you see and not what you think about F. D. R. and his boys? But then again, that would be taking 95 per cent. of your joy of living away from you, so that is not so good.

Joplin, Mo. C. E. HEINZ

"Figures Do Not Lie, But—"

Your comments on the "We" page of the May issue in regard to the A.C.S. golfers proves that CHEMICAL INDUSTRIES needs a good statistician. I check your arithmetic on the free theatre party.

There were 4,142 men registered at the meeting, 39 golf tickets were sold, 36 golfers ate lunch at the golf club, and 34 actually played golf. Two must have been salesmen who got in by mistake and played all their golf on the 19th hole. Even 34 actual "divot diggers" is 0.82% of the total registration as against your figure of 0.01½%. I hope your salesmen friends are not so promiscuous with their decimal points when quoting contract prices on chemicals.

New York City C. R. DELONG

This Is a Real Criticism

To a purchasing agent, your magazine is hard to read. I think that it is a mess from a typographic and layout standpoint. The cover is not particularly in the spirit of the times. Spending a little in the matter of good typographic counsel would be money well spent.

Chicago, Ill. LOUIS H. SCHREIBER

Ask Your Own Congressman

The article in the March issue, "At Niagara Falls—Power Plus," appealed to me particularly in view of our development of power in Oregon at Bonneville. We do have some raw materials here, good chemists and other advantages, particularly cheap power at tidewater. Do you think we will get a reasonable development of chemical industry?

Portland, Ore. DAVID B. CHARLTON

Vox Populi

Let us consider the people, who through their own greed, as well as the greed of those in higher places, were plunged into want and poverty during the depression. They had been assured the water was fine, and they all rushed in. The crash came, and they were stunned; became helpless, desperate. They rushed to the New Deal to lead them out of the valley of desolation.

Have we as manufacturers sufficiently appraised the resulting attitude? I wonder as I read articles and hear discussions. A well-known lawyer berates regimentation and the injustice done investors by various bills. A capitalist tells us that shorter hours are not the solution. An industrialist in his own journal flays old age pension as a debilitating influence on the sturdy worker who in times of plenty laid aside for the rainy day. I wrote and asked him for the prescription to apply to $20 a week workers with families, but he didn't answer.

Remember that people whose stomachs are pinched and who are living on charity are not terrified by "regimentation" if it produces a job; that they don't give a hurrah what you think of "Social Security" when they now have no security at all; that the injustice to investors of various bills leaves them cold when they have lost their all that they had invested; that they are not wholly reasonable when they consider demagogues who promise something when they think they have nothing to lose whatever happens.

On the other hand there is always the chance that the natural recovery from the depression may come in time, so that the people may forget their crusade and reforms may be forgotten. We may avoid regulating utilities; we may emasculate social security; we may return to old working conditions; but we will not have removed those evils which are helpful in producing our regular depressions.

You object to Father Coughlin, Senator Long and Dr. Townsend. You dislike the Rayburn Bill; the Copeland Bill; the Frazier-Lempke Bill; etc. The point you seem to overlook is that each of these men owe their power to some condition, past or present, which rankles with a large part of the voting population and that each of these bills is originated because there are enough who think certain conditions in the past have been intolerable.

Why not realize these conditions? Beat your demagogue to the punch by actively pushing constructive legislation for the general good of the country. Quit groaning, and "belittlin," and initiate. Thank you.

Palo Alto, Calif. PAUL A. GROSS

The Modern Golden Rule

Population of the U. S.	124,000,000
Eligible for Townsend Pension	50,000,000
	74,000,000
Children and Government employees	60,000,000
	14,000,000
Unemployed	13,999,998
Left to produce the Nation's Goods	2

Apparently this puts it up to you and me, and I'm not feeling so well.

New York City LOU NEUBERG

Government in Business

H. S. Miller was right in his letter to you about government business being rotten always and rottener today than it ever was before. He did not state the case half strongly enough.

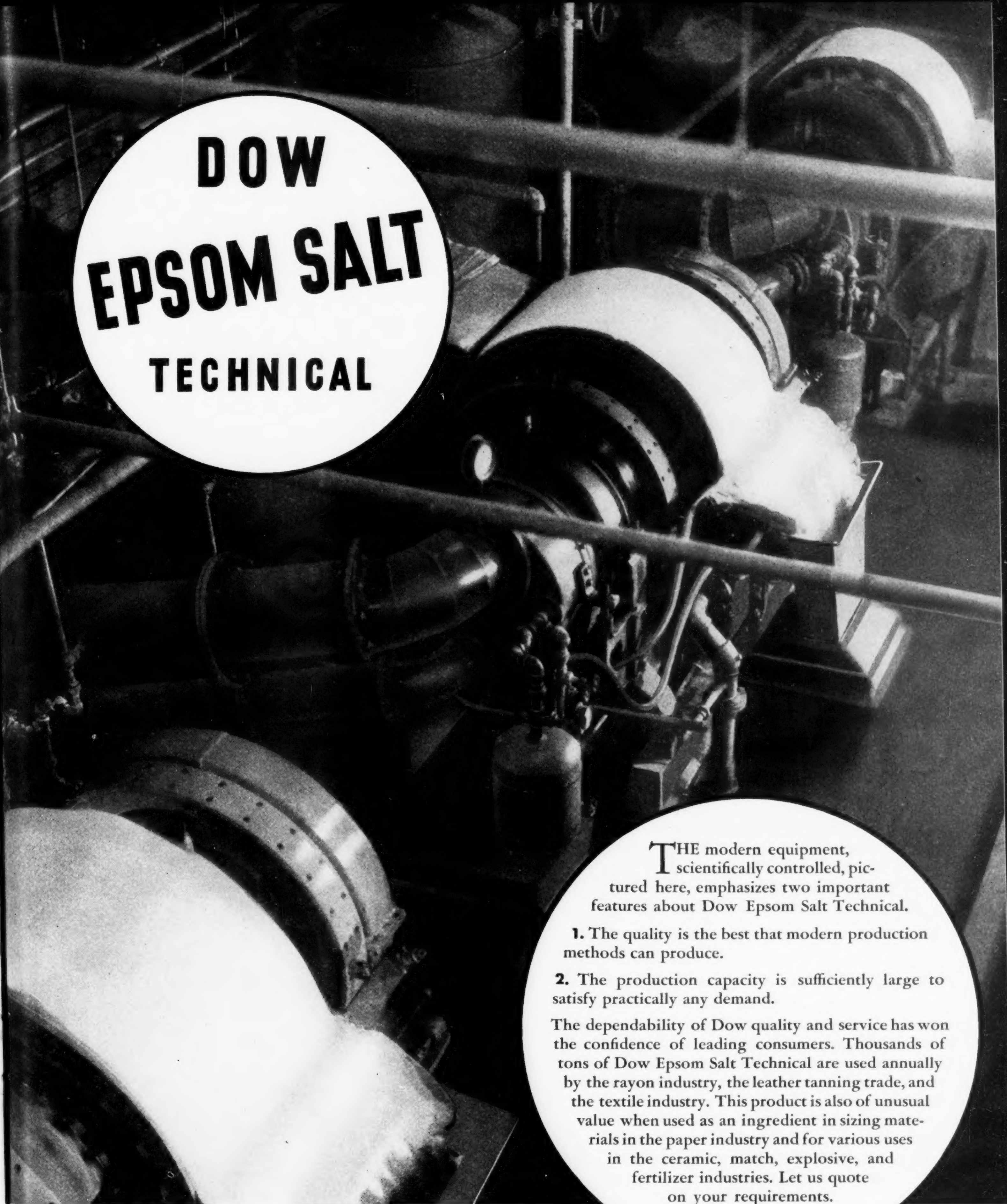
White Plains, N. Y. WILLIAM T. WOODWARD

Deleted by the Censor

I think very highly of CHEMICAL INDUSTRIES and although there are many chemical papers dealing with the pure theoretical side of the industry, your publication fits into my needs exactly. I particularly appreciate the readability of your publication in contrast to some of the others. I wish to compliment you on your fine Patent Section and New Products and New Processes Section, which appear to me to be very nicely edited. I also rather enjoy the personal and human touch you give to the chemical industry as contrasted with the feeling of awe and helplessness to spend an evening, for instance, with . . . .*

Niagara Falls, N. Y. WILLIAM B. LEACH

* Name of competing publication deleted on advice of counsel.
—The Editors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ACETONE ◦ AMYL ACETATE ◦ AMYL ALCOHOL ◦ BUTALYDE ◦ BUTANOL ◦ BUTYL ACETATE ◦ BUTYL ACETYL RICINOLEATE ◦ BUTYL LACTATE ◦ BUTYL OLEATE ◦ BUTYL STEARATE ◦ DIACETONE ◦ DIAMYL PHTHALATE ◦ DIBUTYL PHTHALATE ◦ DIBUTYL TARTRATE ◦ DIETHYL DIMETHYL PHTHALATE ◦ ETHYL FUSEL OIL, REFINED ◦ METHANOL ◦ METHYL LACTATE ACETONE ◦ AMYL BUTALYDE ◦ BUTANOL ◦ BUTYL ACETYL BUTYL LACTATE ◦ BUTYL DIACETONE ◦ DIAMYL PHTHALATE ◦ DIBUTYL PHTHALATE ◦ DIBUTYL TARTRATE ◦ DIETHYL OXALATE ◦ DIMETHYL PHTHALATE ◦ ETHYL ACETATE ◦ FUSEL OIL, REFINED ◦ METHANOL ◦ METHYL LACTATE ACETONE ◦ AMYL ALCOHOL ◦ BUTALYDE ◦ BUTANOL ◦ BUTYL RICINOLEATE ◦ BUTYL

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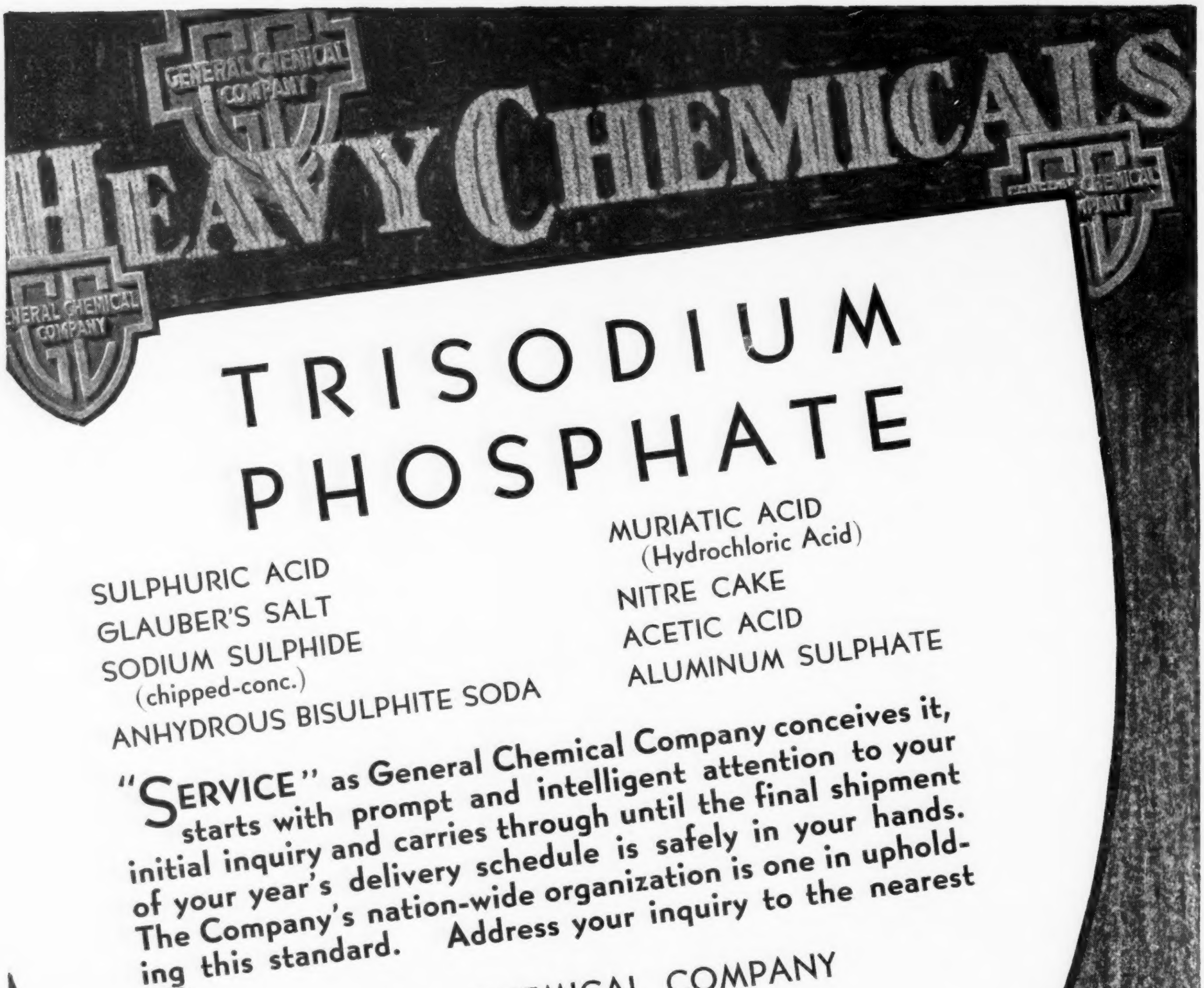

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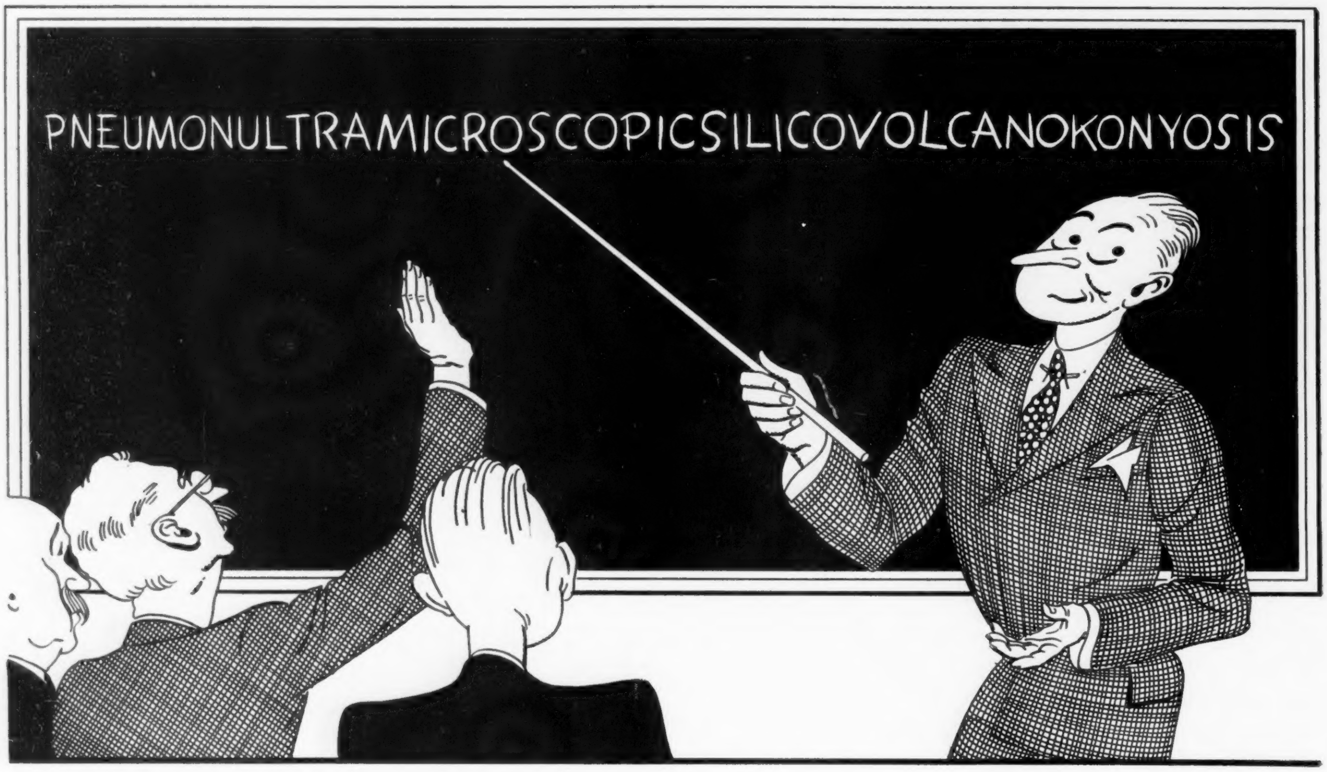
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